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THAMES RIVER BASIN **DUDLEY, MASSACHUSETTS**



SOUTH VILLAGE DAM MA 00107

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION, CORPS OF ENGINEERS WALTHAM, MASS. 02154

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REPORT DOCUMENTATION	PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	•	3. RECIPIENT'S CATALOG NUMBER	
MA 00107	AD-A143	32	
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED	
South Village Dam		INSPECTION REPORT	
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		6. PERFORMING ORG. REPORT NUMBER 6. CONTRACT OR GRANT NUMBER(*)	
U.S. ARMY CORPS OF ENGINEERS		B. CONTRACT ON SHANT RUMBERIES	
NEW ENGLAND DIVISION			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE	
DEPT. OF THE ARMY, CORPS OF ENGINEER	RS	November 1979	
NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 0225	4	13. NUMBER OF PAGES	
14. MONITORING AGENCY NAME & ADDRESS(II differen		15. SECURITY CLASS. (of this report)	
		UNCLASSIFIED	
		ISA DECLASSIFICATION/DOWNGRADING	
		SCHEDULE	
APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, If different from Report)			
Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.			
19. KEY WORDS (Continue on reverse elde if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY,			
Thames River Basin Dudley, Massachusetts			
20. ABSTRACT (Continue on reverse side II necessary and	(Identify by block number)	ان خود به برود در در از در خود برود به در می در از در خود کرد برود برود در در در می برود برود برود برود برود ب ا	
South Village Pond Dam is a concrete gravity dam approximately 160 feet long and 18 feet high. The facility is considered to be in fair condition. Based on size classification, small, and hazard potential classification, high, the spillway test flood is ½ PMF.			



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION. CORPS OF ENGINEERS **424 TRAPELO ROAD** WALTHAM, MASSACHUSETTS 02154

REPLY TO ATTENTION OF NEDED

JAN 17 1980

Honorable Edward J. King Governor of the Commonwealth of Massachusetts State House Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the South Village Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Dudley-Webster Realty Corporation, Webster, Massachusetts 01570.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

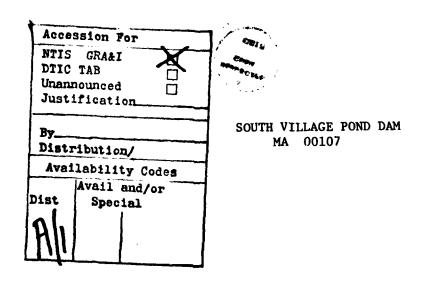
I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely.

Inc 1 As stated

Colonel, Corps of Engineers

Division Engineer



THAMES RIVER BASIN WEBSTER, MASSACHUSETTS

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

Identification No.: MA 00107

Name of Dam: SOUTH VILLAGE POND DAM

Town: WEBSTER-DUDLEY

County and State: WORCESTER COUNTY, MA

Stream: FRENCH RIVER

Date of Inspection: 24 September 1979

BRIEF ASSESSMENT

South Village Pond Dam was reconstructed in 1939. The structure is a concrete gravity dam approximately 160 feet long and 18 feet high. The center portion of the dam is a curved overflow section forming an ogee weir approximately 108 feet long. The overflow section contains a waste gate near its left end. To the left of the dam, there is an abandoned canal. The canal wall adjacent to the river is a concrete gravity section with a 100 foot overflow spillway approximately 90 feet downstream of the dam. Downstream of the overflow spillway, there is an abandoned timber gate structure for the canal.

The facility is considered in fair condition. Stone masonry walls at the left abutment of the dam have collapsed or have been washed away by flood. Erosion of the abutment area has taken place. Concrete surface erosion has occurred at both abutments of the dam.

Based on the size classification, small, and hazard potential classification, high, in accordance with Corps of Engineers Guidelines, the spillway test flood is 1/2 Probable Maximum Flood (1/2 PMF). Hydrologic analysis indicates that the spillway capacity with water surface at the top of the dam abutments is approximately 3,200 cfs with another 1,450 cfs going over the canal overflow spillway which totals to about 30 percent of the routed test flood outflow of 15,600 cfs. The estimated test flood stage is approximately 4.5 feet above the dam abutments at which time significant submergence of the dam would be present.

Investigations are recommended to develop a spillway design flood by detailed hydrologic/hydraulic methods, to determine the structural stability of the dam, spillways and canal dike during the spillway design flood, to determine the need and means of providing erosion protection at the abutments of the dam and the embankment portions of the dike and to determine the required structural repairs of deteriorated concrete at the outlet works and right training wall. Recommended remedial measures include the removal of the remaining flashboard pins from the overflow section of the dam, performing of maintenance work at the dam, the canal and the waste gate, replacement of missing stones in the shore side masonry wall of the canal, removal of vegetation from joints in the same wall, removal of vegetation and debris from within the canal, removal of dense brush and trees from the canal dike and fill resulting holes, rebuilding of eroded areas on the dike between the main spillway and canal overflow and sealing of all outlet pipes leaking water from the canal.

The Owner should develop a formal maintenance program, operational procedure, and emergency procedures plan and should institute a program of annual technical inspections. The remedial measures and recommendations should be performed within one year of receipt of this report by the Owner.

CAMP DRESSER & McKEE INC.

Roset H. Wood

Roger H. Wood Vice President



This Phase I Inspection Report on South Village Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

yphw. Fi JOSEPH W. FINEGAN, JR., MEMBER Wager Control Branch Engineering Division

CARNEY M. TERZIAN, MEMBER

Design Branch

Engineering Division

JOSEPH A. MCELROY, CHAIRMAN

Chief, NED Materials Testing Lab.

bagel Q. Mr Elroy

Foundations & Materials Branch

Engineering Division

APPROVAL RECOMMENDED:

Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm runoff), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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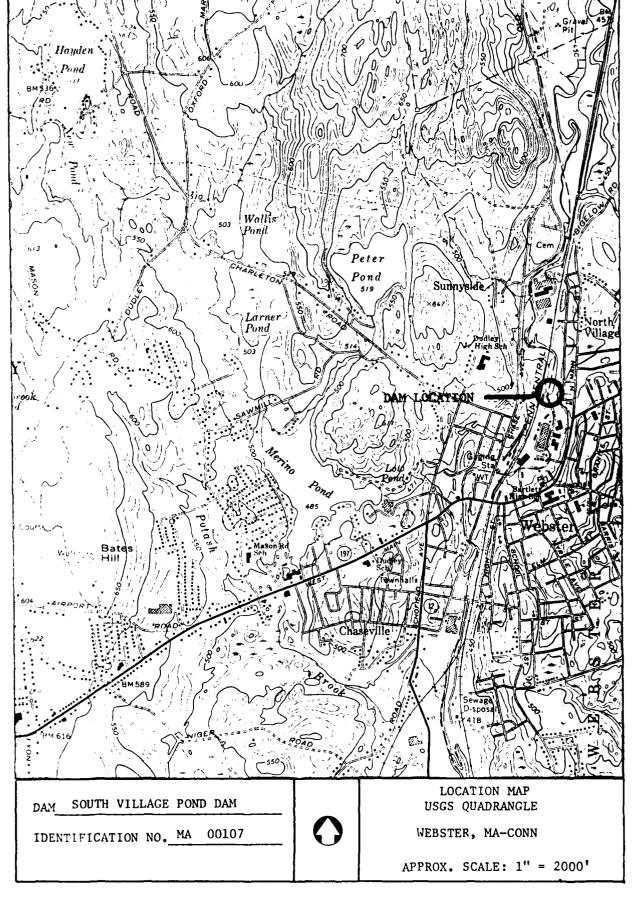
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1. OVERVIEW OF DAM FROM ABANDONED RAILROAD BRIDGE ABUTMENT.



NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

SOUTH VILLAGE POND DAM MA 00107

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Camp Dresser & McKee Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Camp Dresser & McKee Inc. under a letter of 27 March 1979, from Colonel John P. Chandler, Corps of Engineers. Contract No. DACW 33-79-C-0053 has been assigned by the Corps of Engineers for this work. Contract Modification No. P 00001, dated 24 August 1979, was subsequently issued by Colonel William E. Hodgson, Jr., Corps of Engineers. Haley and Aldrich, Inc. has been retained by Camp Dresser & McKee Inc. for the soils and geological portions of the work.

- b. <u>Purpose</u> The primary purpose of the investigation is to:
 - (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
 - (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

- a. Location South Village Pond Dam is located at the end of Church Court off of North Main Street in the Town of Webster, Massachusetts, as shown on the report's Location Map. Access to the west end of the dam is from an abandoned spur track near Boys Club Street off of Oxford Street in the Town of Dudley, Massachusetts. The dam is on the French River, 2,750 ft. upstream of the U.S. Gaging Station in the Town of Dudley. The coordinates for the dam are 71 degrees 52.8 minutes longitude and 42 degrees 03.3 minutes latitude.
- Description of Dam and Appurtenances South Village Pond Dam consists of a curved concrete spillway structure with outlet gates at the left end. A canal with a concrete overflow weir extends approximately 400 ft. downstream from the left end of the dam and is separated from the river by a dike formed by concrete and masonry training walls. Plans of the dam and appurtenances are included in Appendix B.

The concrete dam is approximately 160 feet long and 16 feet high. The right end of the dam is a 42 ft. long plain concrete gravity wall. As it intersects the overflow section, it turns downstream and forms a 31 foot long plain concrete gravity training wall. The overflow portion of the dam is curved towards the downstream channel and has a cord of approximately 107.5 feet. It is also constructed as a plain concrete gravity section with a beveled upstream edge and an approximate ogee section for its downstream surface. The downstream toe of this section forms an apron approximately 5 feet long. At the left end of the overflow section there is a manually operated control gate over a 4 foot by 4 foot opening thru the dam. Above this opening there is a 2 foot 9 inch wide by 2 feet 3 1/2 inches high opening behind the gate stem. This opening has an invert elevation approximately at the top of proposed flashboards. The purpose of this opening is unknown. The overflow portion of the dam was detailed to receive 12 inches of flashboards. Access to the gate operator is by a reinforced concrete bridge spanning approximately 7 feet from the left abutment. The left abutment of the dam is a plain concrete gravity section approximately 6 feet 3 inches long in the direction of the dam but it extends along the river side of the canal approximately 23 feet and along the left side of the downstream river channel approximately 34 feet. The section of wall along the downstream channel appears to be a facing of a stone retaining wall for a railroad bridge abutment rather than an independent concrete wall.

Immediately to the left of the dam is an entrance to a canal. The shore side of the canal is formed by a stone masonry wall while the river side wall of the canal is constructed of plain reinforced gravity sections. Starting at approximately 90 feet downstream of the dam the river side wall becomes an overflow spillway 100 feet in length. The crest elevation of this

overflow is approximately 1 foot above the crest elevation of the main dam. From the end of the canal spillway, the river side wall extends downstream approximately 120 feet. Immediately downstream of the canal spillway there is a wooden gate structure across the waterway to control the canal.

Between the concrete canal wall and the river, downstream of the canal spillway, there is a canal dike approximately 30 ft. wide and has a maximum height of about 19 ft. above the stream bed. The surface of the dike is somewhat irregular but generally slopes toward the river at 3H to IV, or flatter. There is a stone masonry wall which retains the dike toe, along the river.

The dike appears to merge with natural ground near the remains of a burned-out structure located roughly 400 ft. downstream of the dam. The canal has been filled in downstream of this building ruins.

- c. Size Classification The height of the dam is approximately 16 feet and the estimated storage capacity is 120 acre-feet at the top of dam. According to Guidelines established by the Corps of Engineers, the height of the dam is in the "small" category based on both height and storage capacity.
- d. Hazard Classification The results of the dam failure analysis indicates that a failure during a flood stage would increase the downstream flooding by five to six feet. The impact area contains a number of factories and mills as well as a portion of the business district of Webster, Massachusetts. The economic losses would be high and it would place more than a few lives in jeopardy. Consequently, the dam is classified in the "high" hazard classification.
- e. Ownership The dam is owned by the Dudley-Webster Realty Corporation. The owner is represented by Mr. Edward S. Kunkel, President, 661 South Main Street, Webster, MA 01570. (Phone: 617/943-0591).
- f. $\frac{\text{Operator}}{\text{dam.}}$ There is no formally assigned operator to this
- g. Purpose of the Dam South Village Pond Dam was originally constructed to provide hydro-electric power and water to the mills downstream. This use has been abandoned and the present use of the dam is to provide a reservoir for incidental recreation.
- h. Design and Construction History South Village Pond Dam was reconstructed in 1939. The plan on file with the Worcester County Engineering Department indicates that Mr. Charles L. Ware was the engineer. County inspection reports indicate that Chester W. Patten Company, Melrose, Massachusetts was the

contractor. The river side wall of the canal was reconstructed approximately 3 years earlier, 1936. The design engineer and contractor for this work are unknown. Inspection Reports from 1925 to 1955 indicate the owner of the dam was the American Woolen Company. The 1956 inspection reports indicates the Kunkel Brothers were the owners. The 1957 inspection reports indicate the dam was owned by its present owner, The Dudley-Webster Realty Corporation. The present owner indicates that they have owned the dam for approximately 24 years and the previous owner was Textron.

i. Normal Operational Procedures - Maintenance of the dam is performed on a demand basis. There is no operator assigned to the dam.

1.3 Pertinent Data

Elevations given in this report are on the local datum used on the plans on file with the Worcester County Engineering Department. This datum is approximately 4 1/2 feet higher than the National Geodetic Vertical Datum (NGVD).

- a. Drainage Area The dam impounds waters of the French River in the Towns of Webster and Dudley Massachusetts. The total watershed above the dam is 84.6 square miles of which 57.6 square miles contributes flow initially to the Hodges Village and Buffumville Flood Control Reservoirs. About 1/2 of the remaining 27 square miles is tributary to Lake Chaubunagungamaug which has considereable storage potential.
- b. <u>Discharge at Dam Site</u> The discharge at the dam site during the 1955 flood was estimated to be 14,400 cfs. A flow of 4,700 cfs was estimated to have taken place on 19 March 1936.
 - (1) Outlet works size Two orifices at left abutment of spillway. One is 4 feet by 4 feet at an invert of 429.6, the other is 2.5 feet by 2.75 feet at an invert of 436.6.
 - (2) Maximum known flood at dam site 19 August 1955 at 14,400 cfs.
 - (3) Ungated spillway capacity at top of dam 2,950 cfs @ 439.9 elev.
 - (4) Ungated spillway capacity at test flood elevation 9,350 cfs @ 444.4 elev.
 - (5) Gated spillway capacity at normal pool elevation.....N/A
 - (6) Gated spillway capacity at test flood elevation.....N/A
 - (7) Total spillway capacity at test flood elevation 9.350 cfs @ 444.4 elev.
 - (8) Total project discharge at test flood elevation 15,600 cfs @ 444.4 elev.

C.	• Elevation (ft. above Local Datum)		
	(1)	Streambed at centerline of dam424.0	
	(2)	Test flood tailwaterLower than 435.6	
	(3)	Upstream portal invert diversion canal433 (Est.)	
	(4)	Recreation pool435.6	
	(5)	Full flood control poolN/A	
	(6)	Spillway crest	
	(7)	Design surcharge (Original Design)N/A	
	(8)	Top of dam439.9	
	(9)	Test flood design surcharge444.4	
d.	Rese	rvoir (feet)	
	(1)	Length of test flood pool	
	(2)	Length of recreation pool800	
	(3)	Length of flood control poolN/A	
e.	Stor	age (acre-feet)	
	(1)	Recreation pool12	
	(2)	Flood control poolN/A	
	(3)	Spillway crest pool12	
	(4)	Top of dam120	
	(5)	Test flood pool230	
f.	Rese	rvoir Surface (acres)	
	(1)	Recreation pool4	
	(2)	Flood-control poolN/A	
	(3)	Spillway crest4	
	(4)	Test flood pool45	
	(5)	Top of dam	

g.	Dam	
	(1)	Type plain concrete gravity section
	(2)	Length160 ft
	(3)	Height16 ft
	(4)	Top width4.5 ft
	(5)	Side slopesN/A
	(6)	ZoningN/A
	(7)	Impervious CoreN/A
	(8)	CutoffUnknown
	(9)	Grout CurtainProbably None
h.	Dive	rsion and Regulating Tunnel
i.	Spi1	<u>lway</u>
	(1)	Typeplain concrete gravity ogee section
	(2)	Length of weir108 ft
	(3)	Crest elevation 435.6 (without flashboards)
	(4)	Gates 4' x 4' waste gate
	(5)	U/S Channel French River
	(6)	D/S ChannelFrench River, gradients are generally flat both U/S and D/S
j.	spil	lating Outlets - The outlet works are located at the left lway abutment. They consist of one 4 foot square orifice at nvert of 429.6, and another, 2.5 feet high by 2.75 feet wide,

at an invert of 436.6. The lower orifice is controlled by a manual gate at the upstream face of the dam, while the other is not controlled.

SECTION 2: ENGINEERING DATA

- 2.1 <u>Design Records</u> No design records for the original dam were located. A copy of a design plan for the reconstruction of the river side canal wall entitled "Plan of New Canal Retaining Walls and Spillway", dated September 29, 1936, and the specifications for this work were located at the Worcester County Engineering Department. Also located at the same source was a copy of a plan entitled "Plan of Reconstruction of the Dam" dated March 28, 1939. This plan shows the details of the dam observed at the site.
- 2.2 Construction Records No records of the original construction other than the field inspection reports by the County Engineers were located. The County inspection reports for the reconstruction of the dam are more detailed than usual, during one period, they were made on a daily basis.
- 2.3 Operation Records No operation records other than County and State inspection reports were located.

2.4 Evaluation

- a. <u>Availability</u> The records are available at the Worcester County Engineering Department, Worcester, Massachusetts.
- b. Validity The plans are in good agreement with the conditions observed at the site.
- c. Adequacy The available data, in combination with the visual inspection described in the following section, are adequate for the purposes of the Phase I investigations.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General - The Phase I visual examination of South Village Pond Dam was conducted on 24 September 1979.

In general, the concrete dam is in fair condition. The concrete at the left abutment area is severly eroded, while the concrete on the right gravity wall, downstream face, shows surface cracking and efflorescence. The top of the downstream right training wall shows considerable deterioration and erosion. Flow over the overflow section of the dam precluded an inspection of this section.

Visual inspection check lists for the site visit are included in Appendix A and selected photographs are given in Appendix C. Prior inspection reports are included in Appendix B.

Dam - The concrete dam is generally in fair condition.

There was no evidence of significant settlement or lateral movement, but there has been considerable surface erosion of the training walls on the downstream side of the overflow section.

The following specific items were noted:

- (1) The portion of the dam to the right of the overflow section has considerable cracking and efflorescence along its downstream face. The training wall extending downstream from this section immediately adjacent to the overflow portion of the dam has severe deterioration and erosion at the top of the wall.
- (2) In general, the overflow section of the dam was not visible during inspection due to flow. The flashboard pins at the weir crest are severely coroded and some are missing.
- (3) The left abutment area of the dam, as shown in Photo 6, contains the waste gate structure. The upper portions of the concrete section show severe erosion. The short concrete bridge to the operating area, at the left of the waste gate, has exposed reinforcing bars. The left training wall extending downstream from this area also exhibits severe erosion.
- (4) The waste gate is inoperative.
- c. Appurtenant Structures The canal dike is generally in a poor condition, based on visual observations. There was no evidence of major lateral movement or settlement of the dike structure. However, there has been severe erosion of earth

materials and portions of the stone retaining walls along the river have failed. The concrete wall and spillway along the dike are in better condition. The deficiencies noted along the wall and spillway were generally in the form of minor joint deterioration, surface spalls and efflorescence. The timber gate structure, across the canal downstream of the overflow spillway, is in disrepair. However, downstream of the gate structure, the canal has been terminated by the placement of fill. Upstream of the gate structure, the canal was noted to contain some vegetation and brush. Downstream of the gate structure, the water in the canal is stagnant and contains considerable debris.

The following specific items were noted:

- (1) The surface of the dike is covered by grass, weeds, dense brush and trees, as shown in Photo 7.
- (2) There has been severe erosion of the dike between the main spillway and the canal overflow weir as shown in Photos 5 and 7. Local erosion was also noted along the dike downstream of the canal overflow weir.
- (3) The stone retaining wall which parallels the river has failed in the area between the dam and canal overflow and in the area near the downstream end of the overflow as shown in Photo 7. Evidence of local displacement was noted at other places of the wall which extends downstream.
- (4) At the downstream end of the canal, there are the remains of a burned out structure. At this location there is only about 10 feet between the canal wall and the basement wall of the ruins. There is an outlet pipe extending from the canal into the old basement which is valved. A small amount of leakage (perhaps 5 to 10 gpm) was noted coming from the pipe.
- (5) The canal has some vegetation and branches present in the upstream portion and vegetation and debris present downstream of the timber gate structure.
- (6) The canal timber gate structure is in disrepair. There are openings through the bulkhead, the timber gates appear to be silted in and inoperative, and portions of the timber frame are sprung and exhibit some rot.
- (7) The stone masonry wall on the shore side of the canal has some stones missing and vegetation growing in the joints.
- (8) The concrete canal wall and overflow spillway have minor spalls along its length and a major face spall on the right side wall of the overflow spillway. A diagonal crack was

noted near the base of the overflow spillway right side wall. Vertical joints in these walls have started to deteriorate and some vegetation is present.

- d. Reservoir Area The upstream pool is part of the French River. The river has a slight meander in this area. The banks on each side of the pool are undeveloped and forested. They rise up to a railroad track on the right side and to a residential development in the Town of Webster on the left side. There appears to be no significant potential for landslides into the pool which would cause waves to overtop the dam. No conditions were noted that would cause a sudden increase of sediment load into the river.
- e. <u>Downstream Channel</u> The downstream channel is flat with thick vegetation on both banks. There is a stone masonry wall along portions of the left bank. A mill complex is present along the right bank further downstream.
- 3.2 Evaluation Except for the items noted in the visual examination, South Village Pond Dam and canal spillway appear to be in a satisfactory condition. The left abutment area of the dam appears to have the most deterioration. The concrete in this area is severely eroded and stone masonry walls, shown on the design plans to be located along the toe between the dam left abutment and the canal spillway, apparently have collapsed. This may have occurred during the 1955 flood which overtopped the dam.

SECTION 4: OPERATIONAL PROCEDURES

- 4.1 Procedures There is no formal established routine for the operation of the dam.
- 4.2 <u>Maintenance of the Dam</u> The appearance of the dam indicates that little maintenance has been performed at this facility in recent years. Maintenance of this facility is based on necessity rather than a formally established routine or procedure.
- 4.3 Maintenance of Operating Facilities The operating facilities at this dam have not been used for some time. The canal gates are in disrepair and the single waste gate at the dam appears not to have been used for some time. Maintenance of the outlet facilities appears only to be performed when absolutely necessary.
- 4.4 <u>Description of any Warning System in Effect-</u> There is no established warning system or emergency preparedness plan in effect for this structure.
- 4.5 Evaluation Maintenance of this facility is being performed only when asolutely necessary. There is currently no formal operational procedures in effect for South Village Pond Dam. Formal operational procedures, maintenance programs, warning system and emergency preparedness plan should be established.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. General South Village Pond Dam is a "run-of-the-river" project on the French River at the Dudley-Webster Corporate Town Line, Massachusetts. The watershed is 84.6 square miles of mostly rolling terrain, most of which drains to two U.S. Army Corps of Engineers Flood Control Projects. At spillway crest elevation 435.6 (Local Datum) the reservoir storage is 12 ac-ft., increasing to 120 ac-ft at top of dam (El. 439.9). The spillway is an ogee shaped structure about 100 foot long and 15 ft. high, with concrete abutments. The outlet works is located at the left end of the spillway. At one time a 30 ft. wide canal at the left abutment of the dam served the power generating facilities at the American Woolen Co. about 700 feet downstream of the dam. These facilities have been abandoned and part of the canal has been filled-in. The dam is basically a high spillage-low surcharge project.
- b. Design Data No hydraulic/hydrologic design data for the dam was located.
- c. Experience Data The flood of record for the dam occurred on 19 August 1955. The flow recorded at the USGS Gaging Station located at Webster, Massachusetts, about 2,750 feet downstream of the South Village Pond Dam was 14,400 cfs with a corresponding gage height of 26.05 feet above the "zero" of the gage, which is at elev. 411.24 (Local Datum). The resulting water surface at the dam was recorded at elev. 443.9 (Local Datum), and that just downstream of the dam at about 3 feet lower. The depth of water over the spillway would have been about 8 feet. Prior to the August 1955 event, a flow of 4,700 cfs was estimated at the gaging station on 19 March 1936.

Recorded high water marks for the area indicate severe flooding along the French River as a result of the 1955 flood. This information is documented in the U.S. Geological Survey Water-Supply Paper 1420 titled "Floods of August - October 1955 New England to North Carolina."

- d. Visual Observations The visual inspection of the dam was made on 24 September 1979. At the time, the water depth over the full length of the spillway was 0.3 feet. The water depth upstream of the dam was variable, and the freeboard was about 4.7 feet. There was no obstruction to flow over the spillway. The downstream channel was flat with thick vegetation on both banks. A stone masonry wall is present along some of the left bank and a mill complex is present along the right bank further downstream. The gate to the outlet works was closed.
- e. <u>Test Flood Analysis</u> Based on Corps of Engineers Guidelines, the recommended test flood range for the size (small) and hazard (high) is 1/2 PMF to a PMF (Probable Maximum Flood).

A 1/2 PMF was adopted as the test flood for this project. The test flood was calculated using the Corps of Engineers "Guidelines for Estimating Maximum Probable Discharge in Phase I Dam Safety Investigations". The watershed is hydrologically divided into three separate parts. About 31.1 square miles of the drainage area flows to the US Corps of Engineers Hodges Village Reservoir flood control project, and another 26.5 square miles drains to the US Corps of Engineers Buffumville Reservoir flood control project (both flood control projects were constructed after the 1955 flood). Each of these projects has enough "usable [storage] capacity" to contain about 80 to 90 percent of the 1/2 PMF, which is the adopted test flood for the South Village Pond Dam. Therefore, it is reasonable to discount any discharge contribution from both those drainage areas to the peak flow generated from the 27 square mile drainage area downstream of those projects and upstream of the South Village Pond Dam. The watershed characteristics for the areas draining to the flood control projects and for the area draining to South Village Pond Dam are also markedly different. The areas tributary to the flood control projects are "rolling" with little storage while the area tributary to South Village Pond Dam is much flatter and offers a significant amount of storage as verified by the storage potential of Lake Chaubunagungamaug located to the east of South Village Pond Dam. Based on the watershed characteristics for the 27 square mile area downstream of Hodges Village and Buffumville Reservoirs and the area upstream of South Village Pond dam, the 1/2 PMF peak inflow rate of 588 csm was selected for the South Village Pond Dam. The resulting test flood inflow to South Village Pond Dam is approximately 15,850 cfs.

The routed test flood outflow is 15,600 cfs at a stage of 444.4, neglecting outlet works capacity. The depth of water over the spillway would be 8.8 feet. The spillway capacity at the test flood elevation would be about 9,350 cfs or approx. 60 percent of the routed test flood outflow. The outlet works capacity at spillway crest elevation is approximately 9.5 cfs. However, it should be noted that under test flood conditions the dam would have significant submergence by tailwater conditions.

f. Dam Failure Analysis - Both wet weather and dry weather dam failures were analyzed. Based on the Corps of Engineers Guidelines for Estimating Dam Failure Hydrographs, and assuming a failure would occur along 50 percent of the length of the spillway (50 ft) for both cases, the peak dry weather dam failure outflow would be 3,300 cfs and the peak wet weather dam failure outflow would be 8,500 cfs. The dry weather failure assumes zero flow over the spillway and a water level at spillway crest (E1.435.6) prior to failure, while a wet weather failure assumes a water level at the top of dam (E1. 439.9), with the corresponding spillway discharge (about 4,650 cfs) and downstream flooding conditions prior to failure.

The dry weather failure would not overtop the normal river channel and the resulting hazard would be "low". In the event of a wet weather failure, downstream conditions would be quite different. The spillway discharge would be about 4,650 cfs prior to failure, which would flood the American Woolen Co. mill complex by about 2 feet and raise the river stage just slightly below the top of river bank downstream. The additional flow resulting from a dam failure would increase the river stage 5 to 6 feet. Consequently, the river banks would be overtopped considerably, affecting several houses, and additional buildings of the American Woolen Co. About 8 bridges would be overtopped including two railraod bridges and Main Street which also serves as State Route 12, 197, and 31. Thus, the hazard classification due to a wet weather dam failure would be "high".

The 19 August 1955 flood discharge was recorded at 14,400 cfs. This exceeds both the dry weather and the wet weather dam failure outflows of 3,300 cfs and 8,500 cfs respectively. The stage for the 1955 flood averages about 4 feet higher than that which would result from a wet weather dam failure. There was extensive flooding along the French River due to the 1955 flood. Since the 1955 flood, two Corps of Engineers flood control projects were constructed upstream of South Village Dam.

6.1 Evaluation of Structural Stability

- a. Visual Observations There was no visible evidence of dam or spillway instability during the site examination on 24 September 1979. However, severe erosion has occurred at the embankment portion between the main spillway and the canal spillway. Portions of the stone retaining wall along the toe have failed or have been taken out by prior floods. At the downstream end of the canal dike, a portion of the canal wall is supported by only 10 feet of earth, retained by the basement wall of a burned out structure. While these conditions have weakened the dike embankment, they are not considered to warrant urgent remedial action.
- b. Design and Construction Data The drawings obtained from the Worcester County Engineering Department show the basic cross-section of the dam and the canal concrete walls and spill-way. However, there is no data on the earlier dam and canal water retaining structures at this site. The impact of the original structures on the reconstruction of the dam and canal walls is unknown. The concrete sections for this structure appear to have adequate stability for the design water surface, water surface just below the top of the concrete dam. However, it cannot be assumed that these same structures will have an adequate factor of safety for static stability of water surfaces above the top of the dam.
- c. Operating Records There are no operating records for the dam other than State and County inspection reports. However, calculations indicate that during the August 1955 flood, the dam was overtopped by approximately 4 feet of water. It should be noted that since the 1955 flood, two Corps of Engineers Flood Control Reservoirs have been constructed upstream of South Village Pond Dam.
- d. Post-Construction History Changes The dam was reconstructed in 1939. The plan showing details of this work and records of inspection visits were obtained from the Worcester County Engineering Department. In 1936, modifications were made to the canal dike including the addition of a concrete canal wall and construction of a new canal overflow spillway. A plan showing details of this work was also obtained from the Worcester County Engineering Department. Based on a review of these documents, there is no reason to believe that the structures, as constructed, would have been unstable under the design static loading conditions.
- e. Seismic Stability South Village Pond Dam is located along the boundary between Seismic Zones No. 1 and 2 and, in accordance with recommended Phase I Guidelines, does not warrant seismic analysis.

7.1 Dam Assessment

- a. <u>Condition</u> Based on the results of the visual examination, the dam is considered to be in fair condition. Although some repairs are needed, no conditions which would warrant urgent remedial action were noted.
- b. Adequacy of Information The evaluation of the dam has been based primarily on the visual examination, consideration of available records and past performance and application of engineering judgment. Generally, the information available or obtained was adequate for the purposes of the Phase I Assessment. However, it is recommended that additional information relative to the discharge capabilities of the spillway and structural stability of the dam and appurtenant water retaining structures be obtained as outlined in Section 7.2.
- c. <u>Urgency</u> The recommendations for additional investigations and remedial measures, outlined in Section 7.2 and 7.3 respectively, should be undertaken by the Owner within one year of his receipt of this report.
- d. Need for Additional Investigations Additional investigations should be performed by the Owner as outlined in Section 7.2.
- 7.2 Recommendations It is recommended that the Owner arrange for the following investigations to be undertaken by a registered professional engineer. The Owner should implement corrective measures as required based on the engineering evaluations.
 - a. A detailed hydrologic/hydraulic investigation to determine an appropriate spillway design flood considering tailwater submergence and determining, if necessary, the need of erosion protection at the abutments of the dam and the embankment portions of the dike.
 - b. An investigation to determine the structural stability of the dam, spillways and canal dike during a spillway design flood. Consideration should be given to the stabilizing effect of the tailwater during such flood discharges.
 - c. An investigation to determine the required structural repairs of deteriorated concrete at the right training wall of the dam and at the outlet works.

7.3 Remedial Measures

a. Operation and Maintenance Procedures - The following remedial work should be undertaken by the Owner:

- (1) Remove the remaining flashboard pins from the overflow section of the dam.
- (2) Perform maintenance work on the concrete at the dam and canal. This should include the removal of vegetation from expansion joints, the sealing of expansion joints, the patching of spalls and cracks, and the resurfacing of the eroded concrete areas.
- (3) Perform maintenance work on the dam's waste gate to return it to an operating condition.
- (4) Replace missing stones in the shore side masonry wall of the canal. Remove vegetation from joints in the same wall.
- (5) Remove vegetation and debris from within the canal.
- (6) Remove dense brush and trees from the canal dike and fill resulting holes with compacted granular material.
- (7) Rebuild eroded areas on the dike between the main spillway and canal overflow with compacted granular fill and cover with rock.
- (8) Seal all outlet pipes leaking water from the canal.
- (9) Establish a formal maintenance program and operational procedure for the dam.
- (10) Develop an emergency preparedness plan and warning system for the dam.
- (11) Institute a program of annual technical inspections.
- 7.4 Alternatives The canal downstream of the canal overflow spillway currently serves no purpose. An alternative to performing maintenance work and investigations downstream of the canal spillway would be to remove the existing canal timber gates and fill that portion of the canal with compacted earth. The upstream face of the fill should be protected with stone riprap.

APPENDIX A INSPECTION TEAM ORGANIZATION AND CHECK LIST

	Page No.	
VISUAL INSPECTION PARTY ORGANIZATION	A-1	
VISUAL INSPECTION CHECK LIST		•
Spillway: Main Dam	A-2	
Spillway: Canal Overflow	A-3	
Embankment: Dike	A-4	
Outlet Works: Canal	A- 5	

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM	: South Village Pond Dam	DATE: 24 Sept. 1979
SPI	LLWAY: <u>Canal Overflow</u>	BY: R. Wood
CHE	CK LIST	CONDITION
SPI CHE 1.	LLWAY: <u>Canal Overflow</u>	BY: R. Wood
4.	g. General Struct. Condition Walls a. Wall Location (1) Vegetation (2) Seepage or Efflorescence (3) Rust or Stains (4) Cracks (5) Condition of Joints (6) Spalls, Voids or Erosion (7) Visible Reinforcement (8) General Struct. Condition	e. None observed. f. Clear. g. Good 4. a. Upstream Wall (1) None observed. (2) Slight efflorescence. (3) None observed. (4) 1 diagonal crack near base of wall. (5) See (6).

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: South Village Pond Dam DATE: 24 Sept. 1979 EMBANKMENT: Dike (between canal and river) CONDITION CHECK LIST 1. 1. Upstream Slope Not applicable. (U/S side formed by a. a. Vegetation concrete retaining wall). b. Sloughing or Erosion b. Not applicable. (U/S side formed by c. Rock Slope Protection concrete retaining wall). Riprap Failures Not applicable. (U/S side formed by d. Animal Burrows concrete retaining wall). Not applicable. (U/S side formed by d. 2. Crest concrete retaining wall). a. Vegetation b. Sloughing or Erosion 2. c. Surface cracks See 3. a. d. Movement or Settlement See 3. c. See 3. 3. Downstream Slope See 3. a. Vegetation b. Sloughing or Erosion 3. c. Surface cracks Thick brush, grass & trees. a. d. Animal Burrows Significant erosion and apparent e. Movement or Cracking near failure of D/S stone wall, U/S from toe canal overflow. D/S from canal, f. Unusual Embankment or there is local erosion and wall Downstream Seepage displacement. q. Piping or Boils None observed. h. Foundation Drainage Features None observed. i. Toe Drains See 3b. e. f. None observed. 4. General None observed. a. Lateral Movement 2. None known. h. b. Vertical Alignment None known. c. Horizontal Alignment d. Condition at Abutments and 4. at Structures e. Indications of Movement of Surface of dike generally irregular. No evidence of movement except Structural Items along D/S wall as noted above. f. Trespassing Surface of dike generally irregular. g. Instrumentation Systems No evidence of movement except along D/S wall as noted above. Surface of dike generally irregular. No evidence of movement except along D/S wall as noted above. Significant erosion in area between dam and canal overflow. D/S wall displacements noted above. f. Unrestricted. None known.

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: South Village Pond Dam	DATE 24 Sept. 1979 BY: R. Wood
OUTLET WORKS: Canal CHECK LIST	CONDITION
1. Inlet a. Obstructions b. Channel c. Structure d. Screens e. Stop Logs f. Gates 2. Control Facility	 a. Minor branches in water. b. Appears silted in. c. See Spillway - main dam. d. None. e. None. f. None. 2. a. Timber frame weathered - some rot
 a. Structure b. Screens c. Stop Logs d. Gates e. Conduit f. Seepage or Leaks 	present portions sprung. b. None. c. None. d. Timber gates unknown size silted in. e. Open channel.
3. Outlet a. Structure b. Erosion or Cavitation c. Obstructions d. Seepage or Leaks	f. Opening thru bulkhead. 3. See Canal Overflow Downstream end of the canal filled in.
4. Mechanical and Electrical a. Crane Hoist b. Hydraulic System c. Service Power d. Emergency Power e. Lighting f. Lightning Protection	4. Manual operation only-inoperable.
5. Other	5. Left side of canal is stone masonry wall, some stones missing-some vegetation in joints.
	Right side is concrete one exp. jt. broken with seepage downstream face.

APPENDIX B ENGINEERING DATA

DOCUMENTS	<u>Pa</u>	ige No.	
List of Available Do Description of Dam (cuments Worcester County)	B-1 B-2	•
PRIOR INSPECTION REPOR	<u>ts</u>		
DATE	<u>BY</u>		•
January 8, 1925	Worcester County	B-3	
February 7, 1927	Worcester County	B-4	
April 23, 1934	Worcester County	B-5	
March 20, 1936	Worcester County	B-6	
November 9, 1936	Worcester County	B-7	•
August 10, 1939	Worcester County	B-8	
August 11, 1939	Worcester County	B-9-10	
August 12, 1939	Worcester County	B-11-12	
August 13, 1939	Worcester County	B-13-14	
August 14, 1939	Worcester County	B-15-16	
August 14, 1939	Worcester County	B-17-18-19 B-20-21	•
August 16, 1939	Worcester County	B-20-21 B-22-23	
August 17, 1939	Worcester County	B-24-25	
August 21, 1939	Worcester County	B-24-23 B-26-27	
August 22, 1939	Worcester County	B-28	
August 24, 1939	Worcester County	B-29-30	_
August 28, 1939	Worcester County	B-31-32	•
August 31, 1939	Worcester County	B-33-34	
September 1, 1939	Worcester County	B-35-36	
September 7, 1939	Worcester County	B-37	
December 11, 1940	Worcester County Worcester County	B-38	
June 2, 1944	Worcester County	B-39	
December 10, 1045	Worcester County	B-40	•
December 30, 1945	Worcester County	B-41	
December 1, 1947 December 18, 1950	Worcester County	B-42	
July 25, 1955	Worcester County	B-43	
September 13, 1955	Worcester County	B-44	
1956	Worcester County	B-45	•
1956	Worcester County	B-46	
May, 1957	Worcester County	B-47	
May 7, 1957	Worcester County	B-48	
October 25, 1963	Worcester County	B-49	
January 8, 1972	Mass. Div. of Waterways	B-50	_
DRAWINGS			•
N-	TITLE		
<u>No.</u> 1	Plan of Reconstruction of Dam,	B-51	
T	March 28. 1939		
2	New Canal Retaining Walls and		_
4	Spillway, September 29, 1936	B-52	•

LIST OF DOCUMENTS

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SOUTH VILLAGE POND DAM

All available documents are included in Appendix B

Comes TOPHOR CHY Walster In OLENEE ROLL	PLAN NO. WYTH, P. LOAN D.
Marion American Livertanto : Webs	the Plant
DESCRIPTION OF DAM	DESCRIPTION OF RESERVEN I WATCHES
	Hama of Main Stream
and the state of t	Length of Wassished
Thickness sep	Wildth Is Watershed Cultivated
Downstream Slope	Person in Porests
J. Vpstream	Steepness of Blope
Leagth of Spillway	Kind of Soil No of Acres in Watershed
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Fleshboards used Whith Flashboards is Gates	Langth of Reservoir Wroth the
Ben defined by	Max Flow Cu Ft per Sec.
and destructed by A	Head or Flashboard#-Low Water
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	1936 new soil way soil commy free at
	retaining wells,
704 100 mm	
A CONTRACTOR OF THE CONTRACTOR	loc spectary
	2 No. (************************************
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	214 22
LOCATION American Wooden Co Webster P	DESCRIPTION OF RESERVOIR & WATERSHED
LOCATION American Wooden Co. Webster 1 DEBORRIPTION OF DAM Part Wooden On DAM Type Stone Abis. Part stone & log Crib El. 100'	DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream French River
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LOCATION American Wooden Co- Webster I DEBORIPTION OF DAM Type Stone Abts. Part Stone & Log Crib El. 100' Length Height Thickness top 185	C.C. DOCKET NO 14-03 DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream " " any other Streams Length of Watershed Widsh "
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LOCATION American Woolen Co Webster I DEBORIPTION OF DAM Type Store Abts. Part Store & Log Crib El. 100 Length Height Thickness top 185 Double Bottom 225 Length of Spilmay El. Crast of Dam 431 H95-75't Gire of Gazes Canal to cart of spilmay Location of Gazes El top 96 Width Fleshboards or Gazes El top 96 Width Fleshboards or Gazes El top 96 Oam designed by American Wooken Co. Amburet. Michilar Constructed By 1939 Chester W Patten Co. McCrast Jen Constructed By 1939	DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream I any other Streams Length of Watershed Width Is Watershed Cultivated Percent in Forests Steepness of Slope Kind of Soil Rosey Hand pan Lodge Ne of Acres in Watershed I Reservoir Length of Reservoir Length of Freservoir Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Max Flow Cu Ft per S
LOCATION American Wooden Co Webster I DEBORIPTION OF DAM Type Stone Abts. Part stone & log Crib El. 100 Length 85th Height 72 Thickness top 185 Bottom Downstream Blope Ubsiseem Length of Spillway El. Crast of Derm 451 H95-756 What of Gates Canal to cert of Spillway Location of Gates El top 96 Dam destined by American Wooden Co. Ambuer. Mail of Spillway Constructed by 1919 Chater W Patter Co. Malerace Yes Constructed by 1919 Chater	DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream I any other Streams Length of Watershed Width Is Watershed Cultivated Percent in Foreste Steepness of Stope Kind of Soil Rosey Hand pan Lodge Ne of Acres in Watershed I Reservoir Ler oth of Reservoir Wigth Mas Flow Cu Ft per Sec. Head or Flashboards-Low Water Man Flow Cu Ft per Sec. Head or Flashboards-Low Water Agh GENERAL REMARKS 1937 Owned by the American Wooden's Inspected Aug 15993 Lan Little Toerman
LOCATION American Woolen Co Webster I DEBORIPTION OF DAM Type Store Abis. Part Store & Log Crib. El. 100 Length Height Thickness top Ubstram Length of Spilinay El. Crast of Dam Ass. H95-75'e Give of Gazes Canal to cart of spilinay Location of Gazes Fishthourds pred Width Fishthourds or Gaves El tho = 96 Dam designed by American Wooken Co. Ambuer. Mail Tonspucted By American Wooken Co. Ambuer. Mail Tonspucted By 1939 Checker W Patter Co. McCrast Length of Spilinay CENERAL REMARKS See Dudley 1403 for infortuation Language Mail Language Mail	DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream I any other Streams Length of Watershed Width Is Watershed Cultivated Percent in Forests Steepness of Slope Kind of Soil Rosey Hand pan Lodge Ne of Acres in Watershed I Reservoir Length of Reservoir Length of Freservoir Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Huso or Flashboards-Low Water Max Flow Cu Ft per Sec. Max Flow Cu Ft per S
LOCATION American Woolen Co Webster I DEBORIPTION OF DAM Type Store Abts. Part Store & Log Crib El. 100 Length Height Thickness top 185 Bottom 225 Downstream Blope Length of Spillway El. Crast of Derm 431 H95-75't Gire of Gazes Canal to cart of spillway Lucetion of Gazes (anal to	DESCRIPTION OF RESERVOIR & WATERSHED Name of Main Stream I any other Streams Length of Watershed Width Is Watershed Cultivated Percent in Foreste Steepness of Stope Kind of Soil Rosey Hand pan Lodge Ne of Acres in Watershed I Reservoir Ler oth of Reservoir Wigth Mas Flow Cu Ft per Sec. Head or Flashboards-Low Water Man Flow Cu Ft per Sec. Head or Flashboards-Low Water Agh GENERAL REMARKS 1937 Owned by the American Wooden's Inspected Aug 15993 Lan Little Toerman

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Dam No. 14-03

COUNTY OF WORCESTER, MASSACHUSETTS OFFICE OF COUNTY ENGINEER

Neg. Nos.

INSPECTION OF DAMS, RESERVOIR DAMS AND RESERVOIRS

Town Lebster Date Jan. 8, 1925 Dam No.
Location helowslaters Cotton MiName of Pond or Stream French River
Inspected by an option and a second s
Owner .merican Locian Co
MATERIAL & TYPE Stone abt. part stone and log crib woods apron
Dart war. Elevations in feet; above (+) or below (-) full pond or reservoir level.
FOR DAM Bed of stream below 185 top of spillway 25 #
FOR RESERVOIR
top of dam 100 top of flashboards 96 10 11 ground surface below
level of overflow pipe , length in feet 100
width top in feet 18' width bottom in feet 52' size pipe to mill
inches length spillway in feet 70 head in feet
Size of wheel H. P. developed
Size of gates domina location of gates of and the combined additional
Foundation and details of construction of production to the same state of the same s
roofgr notified ledge condition of embankment
Constructed by
Designed by location
Recent repairs and date none
Evidence of leakage none
Condition good Topography of country below valleys widens
Topography of country below valleys widens
Nature of buildings and roads below dam mills and town
No. Acres in watershed
Plans secured Percent watershed in cultivation
Percent in forests
Canal embankment granite masonery from spillway below A(R. bridge then earth-stone downstream 10! wide on top 30! waste way off canal about 150 feet below dam
make the second of the second
······································

County of Worcester

OFFICE OF COUNTY ENGINEER

Court House, Worcester, Mass.

L. O. Marden County Engineer

Feb. 7, 1927

1935.

TownDudley Webster

Dam No 14-03

American Woolen Co. Webster, Mass.

Location South Village

The County Commissioners of Worcester County, acting under Chapter 253, General Laws. as amended by Chapter 178 of the Acts of 1924, said section being headed "Safety of Dams and Reservoirs", have ordered an inspection of your dam. The above Acts states in part regarding the inspection of dams,—

"The county commissioners shall as often as once in two years cause a thorough examination to be made of every reservoir, reservoir dam and mill dam by the breaking of which loss of life or damage to a road or bridge is likely to be caused,—

The commissioners shall cause every examination to be made by a competent engineer who shall report in detail and the work or the changes required for safety and the public good." The County Commissioners hereby order that the following repairs be made to your dam:— (Note:— Repairs to be made are marked with a eross.)

1.	Repair down stream wall
2.	" up " "
3.	" walls to spillway sectionwost end XXXXXXX
4.	" " canal or flume
8.	" concrete walls
6.	* apron to spillway
7.	* Leaks at
8.	Renew planks and timbers
9.	Clean out waste gate pipe or flume
٥.	" canal to mill
1.	Provide new waste pipe or flume
2.	" pipe to mill thru embankment
. B.	Remove flashboards
4.	Lower
.5.	Construct spillway section spillway to befeet
_	andatat
16.	Cut off brush and trees from embankment
.7.	Fill up holes and regrade embankment

Kindly notify us either in person or by letter after you have made these repairs.

Yours very truly,

County Engineer.

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dame, Reservoir Dams, and Reservoirs.

Inspected byL.	O. Marden Coulci	N M Date 4-23-34	Dam No. 14-03
Town Webster	Loca	stion French River	
Owner American	Woolen Company	Usepowe	er end washing
- -			
			Year
SPILLWAY—Length	Feet. Depth	Feet	
El. top Abutment	El. Crest	El. Apron	El. Streambed
Width top Abutment	Width top Crest	Width bottom Spi	llway
Width Flashboards car	rriedK	Kind Flashboards	
El. Flowline Cleanout	Pipe8	size and Kind Cleanout Pipe	
Kind of Foundation un	nder Spillway		
Condition	st abutment should be eliminate leaks duri	nø low water	orush out of
EMBANKMENT—Lei	ngth overall Feet		
El. Top	El. Natural Ground	Width Top)
Width of Bottom	Upstream Sic	ре Down	stream Slope
Kind of Corewall			Riprap
Material in Embankme	rnt	Foundation	
Sise	Kind	El. Flowline	D
ConditionQK			······································
WHEEL	Kind	SiseRa	ted H. P

*			
Topography of Country	y below Dam		
Nature of Buildings and	d Roads below Dam		
			are Miles
Discharge in Second Fe	eet per Square Mile		
Estimated Storage Mill	lion Cubic Feet		

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

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Inspection	of Dams, Reser	voir Thomas and Reservois	m. 14-03
Inspected by Finlayson and Va	s:el i n	Date 0/20/36	,
Town Webster	Losstian	French River	
Owner American hoolen Co.			
Material and Type			
material and Type			
Dam Designed by			
SPILLWAY-LengthFeet. De	epthFee	t	
Fl. top Abutment El. Crest		El. ApronE	1. Streambed
Width top AbutmentWidth t	op Crest	Width bottom Spillwe	
Width Flashboards carried	Kind F	lashboards	
El. Flowline Cleanout Pipe	Size an	d Kind Cleanout Pipe	
Kind of Foundation under Spillway			
Condition SQ2 Other gig	<u>n où livet</u> .		
EMBANKMENTLength overall	Feet		
El. Top El. Natural	Ground	Width Top	***************************************
Width of Bottom Up	etream Slope	Downstr	eaun Slope
Kind of Corewall	•• ••••••••••	Ripı	ър
Material in Embankment		Foundation	*****
Condition	•••••		
	•••••		***************************************
GATES	·····	Location	
SizeKind	************	El. Flowline	······································
Condition	•••••		

WHEEL Kind	Siz	eRated	H. P
Location	•	Ave. Head	••••••
Evidence of Leaks in Structure	••••••		
Recent Repairs and Date	•••••••	***************************************	•••••••••••••••••••••••••••••••
Topography of Country below Dam			•••••••
	•••••••••	***************************************	·
Nature of Buildings and Roads below Ds	am		
Number of Acres in Pond		Drainage Area in Square	Miles
Discharge in Second Feet per Square Mil	le		***************************************
Estimated Storage Million Cubic Feet			*************************************

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Town Webster	Location French hiver
	n Co. Use
Material and Type	ng walls to canal and canal wasteway under con-
- -	is satisfactory.
Danı Designed by	Constructed by Year
SPILLWAY—LengthFo	·
	El. Crest
Width top Abutment	Width top CrestWidth bottom Spillway
Width Flashboards carried	Kind Flashboards
El. Flowline Cleanout Pipe	Size and Kind Cleanout Pipe
Kind of Foundation under Spilly	way
Condition Loundation to	heel of case, wasteway completed.
EMBANKMENTLength overs	allFeet
El. Top El. N	Natural Ground
Width of Bottom	Upstream Slope Downstream Slope
Kind of Corewall	Riprap
Material in Embankment	Foundation
Condition New Concrete	retaining wall constructed to join with easterly
abutment of waste	eweir of main cam.
GATES	Location
Bise	Kind El. Flowline
Condition	
•••••••••••	
WHEEL Kind	Size Rated H. P.
Location	Ave. Head
Evidence of Leaks in Structure	
	A
Recent Repairs and Date	
Topography of Country below D	am
1992	
Nature of Buildings and Roads b	pelow Dam.
Number of Acres in Pond	Drainage Area in Square Milesuare Miles

Messers Ware-Ro	of Tams, Reservoir Du olton- & Miller contra L.H.Spofford Date Be	ctor present -10-1939 Dam No. 55-03
form Webster	Location_	French River
)wner American Wo	olen Co. U	se
		El.ApronEl.St.Bed
width top Abut	Width top Crest	Width bottom Sp.way
width flashboards_	Kind F	lashboards
El.Flowline Cleanou	it Pipe	Size and Kind Pipe
dind of Foundation	under Spillway	
<u>FUBARLIENT</u>	El.Natural Ground	Vidth Top
		Vidth Top
		Downstream Slope
		Biprap
laterial in Embanic		Foundation
laterial in Embanic		Foundation
daterial in Embanic Condition		
daterial in Embanum Condition GATES	roc	etion
daterial in Embanim Condition GATES Size		
GATES Condition Condition Condition Condition	Loc	etionFi.Flowline

Torm Watull	Location	Principal Diran in
Owner	Us	(ovi)
El.top abutment	El.Crest	El.Apron El.Ct.Bed
Width top Abut	width top Crest	Width bottom Ep.way
		lashboards
El.Flowline Cleanout	Pipe	Size end Kind Pipe
Kind of Foundation v	inder Spillway	
CORCIOIONA_	3 geplanten	مناسقة سنك شيخامك المعارض سان المستدر
- 1/2 - de co 12	Dine - Harris	- c- all necessaries
•		
ALBANICENT		
	1.astural Ground	Tidth lop
		Downstream Grope
		Plomay
Haterial in Embanisc	nt	Foundation
•		
- "		****
		tion
Size	Kind	Ei.Fiowline
Condition		
		
Evidence of Leaks in	Structure	•
Recent Repairs and P	ate	
impaire and r	~~~	

The Dail and Johns ky so to ten har been made to regulate to Mi Maridon, Think start I melencated day bould (day his say of love) while and applied - so part so the dam. The storms on put up forther and summer the could would proper come of fifther out of the land wind. The west would a desting invidently in son side of trulely into the Mary Line main of will 1-30 when I considered the place or it amons for ments much due to durbed of some me, and after conference with The sold a smedered work with Ay 13th (Senty) when pand can be loved to Resonment of the condition of hundring what a wooden poles and wooden to be when when the poles with a wooden when when wolld with the brukeles with the br

COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER Inspection of Dams, Reservoir Dams, and Reservoirs. Date 4119 12/939 Dam No 12/93 Qwner_____Use_____ Dam Designed by Constructed by SPILLWAY El Apron El Streambed El. top Abutment... El. Crest..... Width top Abutment......Width top Crest......Width bottom Spillway..... Kind of Foundation under Spillway Condition **EMBANKMENT** Kind of Corewall. Riprap. Material in Embankment......Foundation..... Condition anna de la companya del companya de la companya de la companya del companya de la companya del la companya del la companya de GATES.....Location.... Size Kind El Flowline Condition Carried Control of the Control of th WHEEL Kind Size Rated H. P. Location Ave. Head Recent Repairs and Date Evidence of Leaks in Structure Topography of Country below Dam. And the second s Nature of Buildings and Roads below Dam A STATE OF THE STA Number Acres in Pond Drainage Area in Square Miles Rischarge in Second Feet per Square Mile Estimated Storage Million Cubic Feet

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Twelly job of found that he lies had been the and did not round boilds romoved . Pond was down down obst 32 H and work again compared melerculting builds, A timber who and a tember thrust were closed to soone to lele, Blue day was removed down to their grade 420 when graved and hard por were incomments from ver built met consti lotally 22 bags of coment of a my sonavial strings than 1:2:4 was court first offert constitution a musider of aux in of suntil and nother book fless ut the west seen of the contain nawwell escaping injuming a man-

COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

	Inspected by A H Poly				
, es	Town Wichtly.		ion. America	or weden les	
	Owner		Use	<u></u>	
	Material and Type			over)	******************
A Section					
•	Dam Designed by				
	39	. "			•
144 🙀 🐪	SPILLWAY	in the second			
	El. top Abutment El.		•		
4 i	Width top AbutmentWid	-		-	
	Width Flashboards carried	Kind	Flashboards	*********************	······································
	El. Flowline Cleanout Pipe	Size	and Kind Cleanout	Pipe	·····
).eg	Kind of Foundation under Spillway	7		••••••••	
•	Condition				······································
		•••••		~ 	
	EMBANKMENT				
F	El. TopEl. Nati	ural Cround	Width Ta	NA.	
	Width of Bottom			•	
	Kind of Corewall	•		•	
•	Material in Embankment			•	
		•			
	Condition			***************************************	•
A	Condition				
*	Condition		Location		
	Condition. GATES. Size. Kin	nd.	Location El I	Towline	
	Condition. GATES. Size. Kin	nd.	LocationEl. I	Towline	
	Condition GATES Size Kin Condition	nd	Location El. I	Towline	
	Condition GATES Size Kin Condition	nd	Location El. I	Towline.	
	Condition GATES Size Kin Condition WHEEL Kind Location	nd	Location El. I	Towline Rated H. P.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure	nd	Location El. I	Towline Rated H. P.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure	nd	Location El. I	Towline.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure	nd	Location El. I	Towline Rated H. P.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dare	nd.	Location El. I	Towline Rated H. P.	And the second s
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dans	nd	Location El. I	Towline Rated H. P.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dans	nd	Location El. I	Towline Rated H. P.	
	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dam Nature of Buildings and Roads bek	nd	Location El. I	Powline.	
•	Condition GATES Size Kin Condition WHEEL Kind Location Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dans	nd	Location El. I	Powline.	

Visile job in afternoon no pregues since Malanda, except a small month of form work for he main spilling, no excepting work done on this dail

COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

August 1997	Inspection of Dams, Re	servoir Dems, and R	eservoirs.	·
1 40			Dam No. 55	ر بر در ه
nspected by	ATTO - CONTAGE	A-Date 11.7	Dam No.	
my Websly	Local	tion American	Works Co	
)wner		Use		
Material and Type			(Trei)	
	-			
Dam Designed by				
BPILLWAY	• ·			
El. top Abutment	El Crest	El Apron	El Streamhed	•
Width top Abutment				
Width Flashboards carried	-			
El. Flowline Cleanout Pipe.				
-			•	
Kind of Foundation under S	ipiliway	La CE Day as		
Condition Carelet			inimale in entrance petitigs.	L X.La.z
14//413 045/	7 74			
EMBANKMENT			•	
El. Top	El. Natural Ground	Width Top)	
Width of Bottom		•	-	
Kind of Corewall			Riprap	•• •••••
Material in Embankment		Founda	tion	
Condition				

GATES				
Size				
Condition	····			
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
WHEEL Kin	d	Size	Rated H. P.	
ocation	**;,	Ave. Head		
Evidence of Leaks in Struct	ture		, , , , , , , , , , , , , , , , , , ,	
Recent Repairs and Date	•	•	'd's .	
Topography of Country bek	Aw Dam			
copography of Country bea				
Vature of Buildings and Ro				4 :
Astrice of Daimings and to				
Number Acres in Pond				
Discharge in Second Feet p		=	-	
Discharge in Second Feet p Estimated Storage Million (
ssumated Storage Million (UDIC Feet			

going on at cost and if species and forms.

temp placed in prejection for according to monour.

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COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

A Marian		ENGINEER		
	12 /	rvoir Dams, and Reservoir		-
Inspected by	मूल व	Date 6 15 39	Dam No.	∙≎3
rown Websty	Locatio	n American 2	vorlen Co.	
Owher		.Use		• • • • • • • • • • • • • • • • • • • •
Material and Type		(<u>a</u> v	<u>=1)</u>	
Dam Designed by	Const			
SPILLWAY.	and the same		•	•
El. top Abutment	El. Crest	El. Apronl	El. Streambed	· ······
Width top Abutment	Width top Crest	Width bottom Spillwa	y	
Width Flashboards carried	Kind I	Tashboards		
El. Flowline Cleanout Pipe	Size a	nd Kind Cleanout Pipe	******************************	
Kind of Foundation under Sp Condition				• · · • • • • · · · · · · · · · · · · ·
EMBANKMENT	***************************************		•	•
El. Top El	l. Natural Ground	Width Top		
Width of Bottom	Upstream Slope	Downstre	eam Slope	
Kind of Corewall		Riprap.	······································	
Material in Embankment	***************************************	Foundation		
Condition			and the second s	
GATES		Location		· ······
Size	Kind	El. Flowline.		
Condition	**************************************			
				-
WHEEL Kind				
Location		Ave. Head		
Evidence of Leaks in Structu	re			
	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	•	4	
Recent Repairs and Date				
Topography of Country below	v Dam	1.9		
				
Nature of Buildings and Rose	is below Dam			,
	······································			
Number Acres in Pond				
Discharge in Second Feet per	Square Mile			
Estimated Storage Million Cu	bic Feet	• • • • • • • • • • • • • • • • • • • •		· - · · ·

Mr. Whide called job of 8-15 and of us pereing of consists until personal inspection to present my ment aliant forces but has recent my ment of the time as any the grade is lowered in our regret and the trulable readless with ground lefters noury + grade was lower and garanty and well Harry out of May was placed and talkboard exalled in color the point of well of what worken.

WORCESTER COUNTY ENGINEER Inspection of Dams, Reservoir Dams, and Meservoirs Inspection of Dams, Reservoir Dams, mine seems, mine seems, mine of Dam No: 68-08 fown lobster Location French Rivers Owner American Woolen Co. Use SPILEWAY El. top abutment Ei. Crest El. Apron El. 6t. Bed Width top Abut. Width top Crest Width bottom bp. way Width flashboards El. Flowline Cleanout Pipe Size and Kind Pipe Kind of Foundation under Spillway Kind of Foundation under Spillway Condition easterly abutment poured-also easterly section new Dges spillway. -have excavated westerly bank for additional cutoff foundation under spillway excavated toward west side River. ELBAHLLIENT E. Top El. Natural Ground Width Top Winth of Borrom Upstream Elope Downstream Slope Kind of Corewall Riprap Material in Embaulment Foundation Condition Evidence of Leaks in Structure Recent Repairs and Date Number Acres in Pond Drainage Area in Sq. Miles Discharge in Second Feet per Square Miles Estimated Storage Million Cubic Nest

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COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

instanta by (H) had been	tion of Dame, Reservoir Dams, and Reservo	Dem No	_
			-
	Location Invertee Wo		
Owner	Uee		·
Material and Type		over)	••••
Dam Designed by	Constructed by	Year	••
SPILLWAY	and the same of th		
El. top Abutment El.	Crest El. Apron	El. Streambed	
	dth top CrestWidth bottom Spillw		
Width Flashboards carried	Kind Flashboards		
El. Flowline Cleanout Pipe	Size and Kind Cleanout Pipe		••••
Kind of Foundation under Spillway	7		.
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EMBANKMENT			
	ural GroundWidth Top		
——· •	Upstream Slope Downst		
	Riprap		
	Foundation		
=			
	Location		
	nd El. Flowline		
	b,		
	Size Rat		
	Ave. Head		
Evidence of Dears in Structure		**************************************	*****
Recent Repairs and Date		**************************************	
	1		
	ow Dam		
	D		
	Drainage Area in Squ	`	<u>-</u>
Discharge in Second Feet per Squa	re Mile		
Estimated Storage Million Cubic F	eet	***************************************	

from at jot at 9-15. Pring had not get been stated, Josting grace was rough my not properly classed out Had the Hoose mating dewel out and the hood · leveled off, bring white at 11 MM Mines books down of 115, was out of aminescen for our mere they come three talks and broke again , Pouring companded for the they

COUNT	•		SSACHUSETT	S ,
The state of the s	••	NTY BNGINEE		12.
		ns, Reservoir Dams, and	,	14-6
Inspected by	spofere	Date	7 39 - Dam No. 5	
- What	- 17	1 Z	an Worlen	Ci.
Owner		Use	/. I	
Material and Type				
and a period	•	_		
Dam Designed by				-
•	•			
SPILLWAY El. top Abutment	F1 (04	501 A	ISI Samonda A	
Width top Abutment				
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El. Flowline Cleanout Pipe				
Kind of Foundation under S				
Condition	-			
EMBANKMENT				
El. Top F	El. Natural Ground	1 Width '	Гор	
Width of Bottom	Upstres	ım Slope	Downstream Slope	
Kind of Corewall			Riprap	
Material in Embankment	***************************************	Foun	dation	
Condition	······································	***************************************	***************************************	· · · · · · · · · · · · · · · · · ·
GATES				••••
Size				
Condition				
· ·	161		t'	
WHEEL Kind				
Location				
Evidence of Leaks in Struct				
				• •
Recent Reneirs and Date			,	
	w Dam		45	04
Topography of Country belo	······			
Topography of Country belo	ads below Dam		***	
Topography of Country belo	ads below Dam			

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was in process on faiting previous.

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COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

Inspection of Dams, Reser	rvoir Dams, and Reservoirs. 14-03
Inspected by	Date 5 di 37 Dam No
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Recent Repairs and Date	
Topography of Country below Dam	
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Nature of Buildings and Roads below Dam	
Number Acres in Pond	Drainage Area in Square Miles
Discharge in Second Feet per Square Mile	
Estimated Storage Million Cubic Feet	

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COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER

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AN ANALYSIS	COUNTY OF WORCESTER MASSACHUSETTS	
	COUNTY ENGINEER	
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WORGESTER MASSACHUSE COUNTY ENGINEER Width top Abutment......Width top Crest......Width bottom Spillway..... Width Flashboards carried Kind Flashboards El, Flowline Cleanout Pipe....... Size and Kind Cleanout Pipe..... Kind of Foundation under Spillway Condition **EMBANKMENT** Kind of Corewall Riprap. Material in Embankment......Foundation.... GATES Location Sise Kind El Flowline Kind Size Rated H. P. WHEEL ... Location Ave. Head Recent Repairs and Date Topography of Country below Dana The second secon Nature of Buildings and Roads below Dam Discharge in Second Feet per Square Mile Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS OOUNTY ENGINEER

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Odunty Enginers Inspection of Dama, Reservoir Dams, and Reservoirs Dam Designed by Constructed by SPILLWAY—Length Feet Depth Foet El crest El Apron El Stredmbed Width top Abutment Width top Crest Width bottom Spillway Width Flashboards carried Kind Flashboards Kind of Foundation under Spillway Condition EMBANEMENT—Length overall Feet Width of Bottom Upstream Slope Downstream Slope Kind of Corewall Riprap Material in Embankment Foundation Condition GATES Location Size Kind El Flowline Condition Kind H. P. Location Ave. Head Evidence of Leaks in Structure Recent Repairs and Date Topography of Country below Dam Nature of Buildings and Roads below Dam And the state of t Number of Aareë in Pond Discharge in Second Feet per Square Mile Estimated Storage Million Cubic Feet

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	COUNTY ENGINEER Inspection of Dams, Reservoir Dams, and Reservoirs.	
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WORCESTER COUNTY ENGINEERING DEPT. WORCESTER, MASS. DATE June 2. 1149 Subject: Dam No. 14-03 Dualty TO Learcy they entire face of most hark Spillwan.

COUNTY OF WORCESTER MASSACHUSETTS COUNTY ENGINEER Inspettion of Dine, Reservoir Dams, and Reservoirs. Date 2-10-4-1 Bam No. Walter Location Final Run SPILLWAY M. top Abutment El. Crest Width top Abutment Width top Abutment Width top Crest Width bottom Spillway Width Flashboards carried Width Flashboards carried Kind Flashboards Kind of Foundation under Spillway Condition 012 **EMBANKMENT** El. Top Width Top Width Top Width of Bottom. Upstream Slope Downstream Slope Kind of Corewall Riprap Material in Embankment. Foundation Condition O.K. GATES Location Sine El Flowline Condition CK WHEEL Kind Size Rated H. P. Location Ave. Head Evidence of Leaks in Structure 4/1 Recept Repairs and Date. Topography of Country below Dam New York Control of the Control of t Nature of Buildings and Roads below Dam Number Acres in Pond Drainage Area in Square Miles Discharge in Second Feet per Square Mile Estimated Storage Million Cubic Feet

	WORCESTER CO	UNITY ENGINEER	Reservoirs	54
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TOWN Dudley-Webster
LOGATION AM. Woolen Co. Plant Total Town Man of the same LOCATION Am. Woolen Co. Plant strkam French R. WORDESTER COUNTY ENGINEERING DEPARTMENT WORDESTER, MASSACHUSETTS WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT gwago sy Am. Woolen Co. PLACE Webster use power-ind-(Napegrap ev L.O. Marden Dec. 1, 1947 TYPE OF BAN Concrete spillway type condition good SPILLWAY FLASHEDARDS IN PLACE 128 RECENT REPAIRS none EMBANKMENT RECENT REPAIRS none good GATES RECENT REPAIRS none good CONDITION CONDITION REPAIRS NEEDED none; except need walkway from across againto gates at spillway. Now serious pone visible

DATE Dec.1.1947

County Maintel

APPENDIX B-41

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WORGESTER COUNTY ENGINEERING DEPARTMENT	Albana .
WORCESTER, MASSACHUSETTS	
DAM INSPECTION REPORT	
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Corporation Numberies by L.O. Marden-W.O. Lindquistre July 25, 1955.	
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THE DE DAM Stone and concrete CONDITION good, exce	
around ast gate a	ction.
SPILLWAY	V
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and the second s	<u> </u>
GATES	
RECENT REPAIRS NODE	100
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concition East end spillway, cleanout gates concrete structure	pelled
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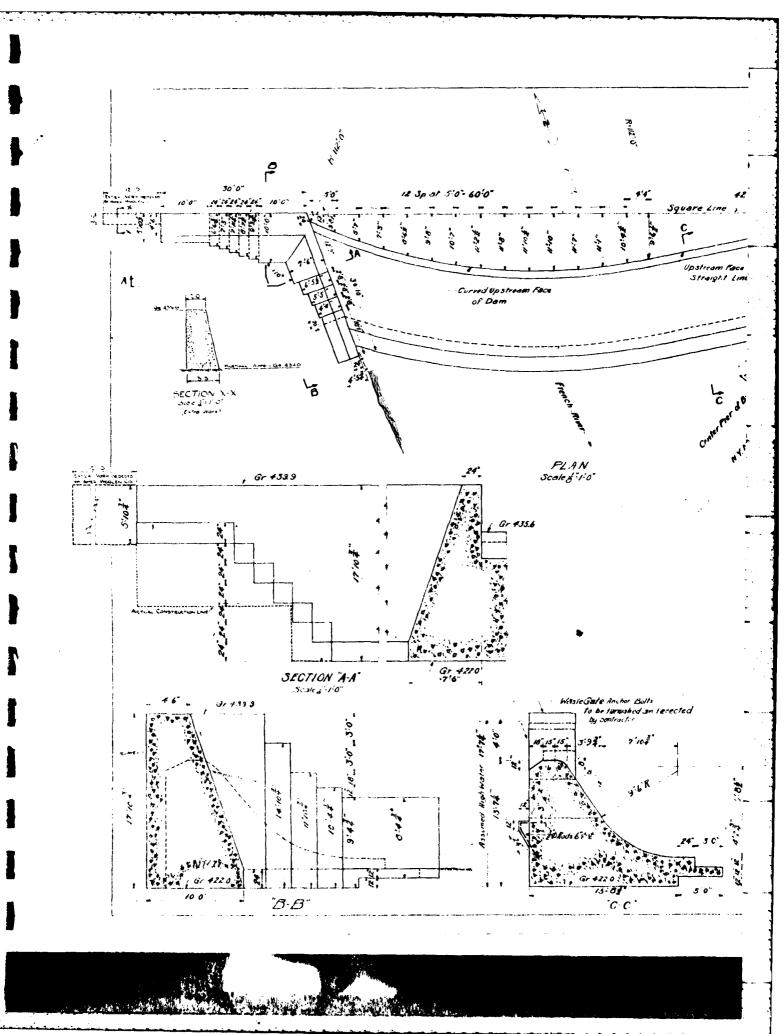
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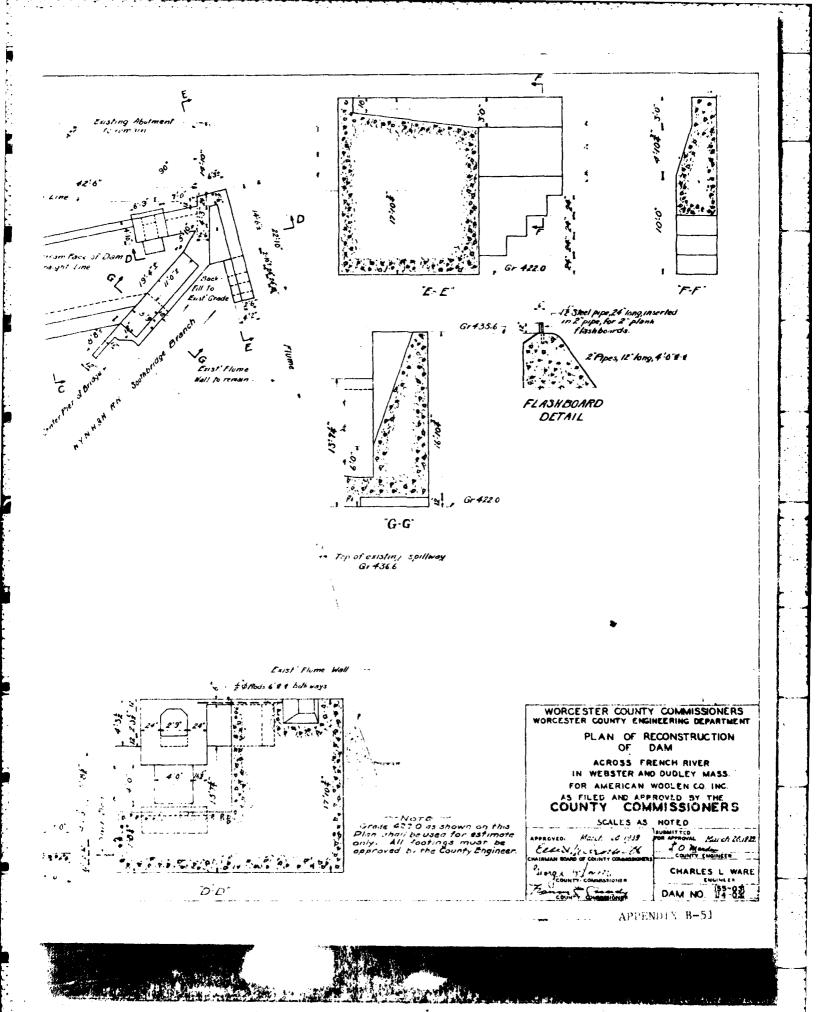
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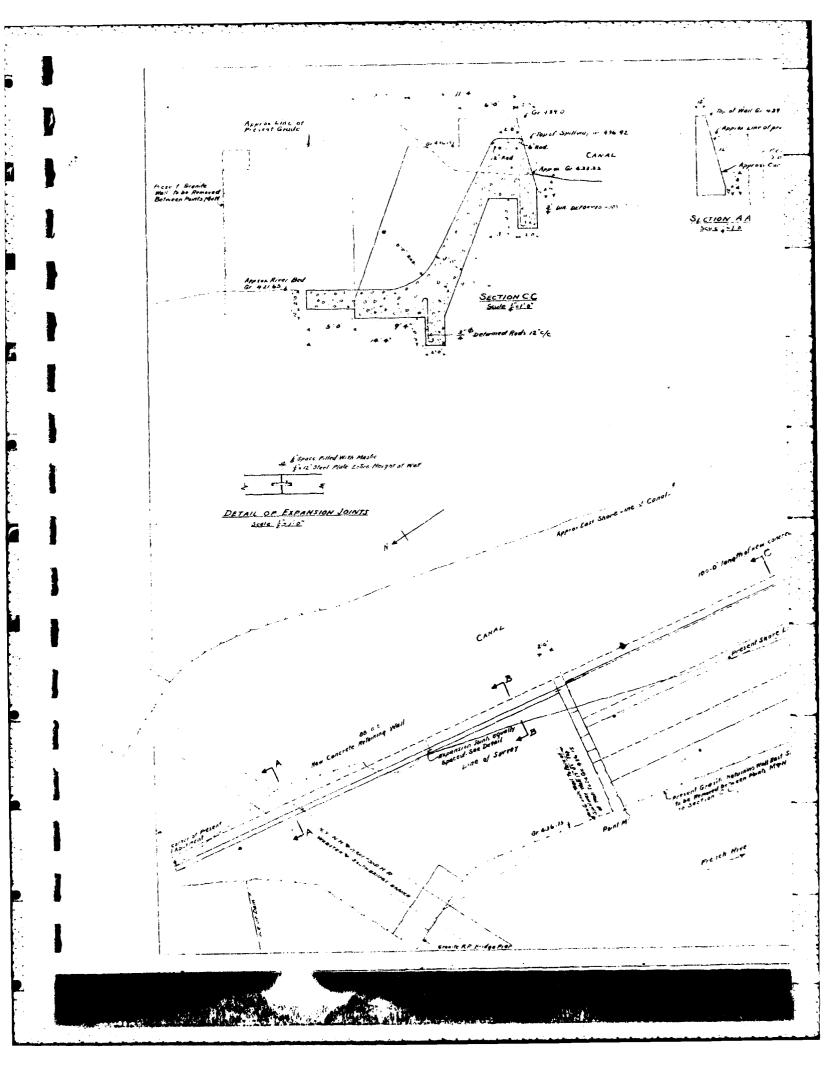
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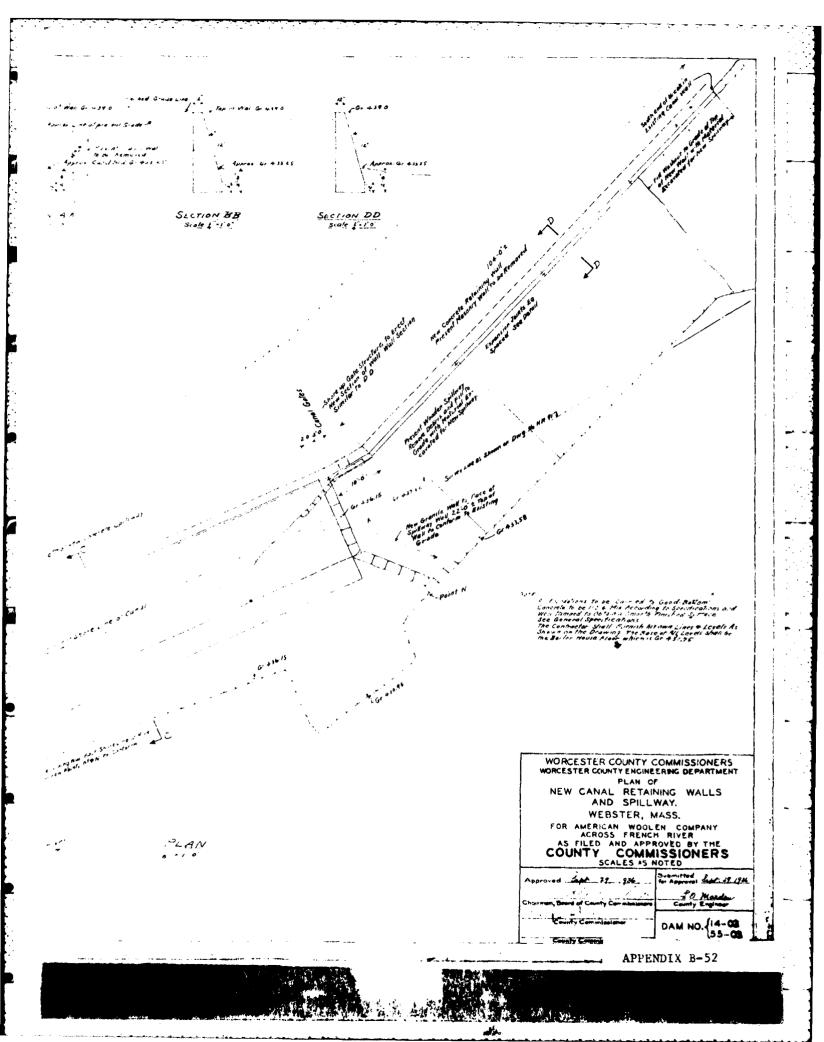
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	INSPECTION REPORT & DATA FOR DAMS Dam No. 19-05 Town: Town: 19-05
	Owner: DUBLEY - WEBSTER REPUTY CORP Stream: WINDER FINER His Address: 141 6. MAIN 5T WEBSTER Fond: Function of Dam: COUTH VILLAGE DERIY WILL FOR Date: 1/18/74
	by:
	Location & Access: 100 ybs South From The CONDITION RATING S. AMN ST 9 MAIN ST Structural: 6001 USGS Ound whater Let 4207/5/1008 7/5/50" Hydreulic: 120/75/
	USGS Quad. Webster Lat. 42'03'15'Long. 7/52'50" Hydraulic: 130'X3' Drain.Ar. 3539 Sq. Ni.: Ponds: ac.; Res. @dam: 1500 General: Character of D.A.: PRIORITY: West:
	Estimated Discharge:
	General Description of Dam and Discharge Control: 4'X4' GATE AT EASTERLY END OF DAM SPILLWAY TNOT IN USE. GATE CONTROLS RUSTED & ROTTED, SPILLWAY 100 USE. GATE CONTROLS RUSTED & ROTTED, SPILLWAY
	HAS SOME FLASHBOARDS ON TOP BUT NOT CONTINUOUS, Sketch (Not to Scale):
À	FLOW 4'X4' GATE 11-11 SPILLWAY SIDE VIEW
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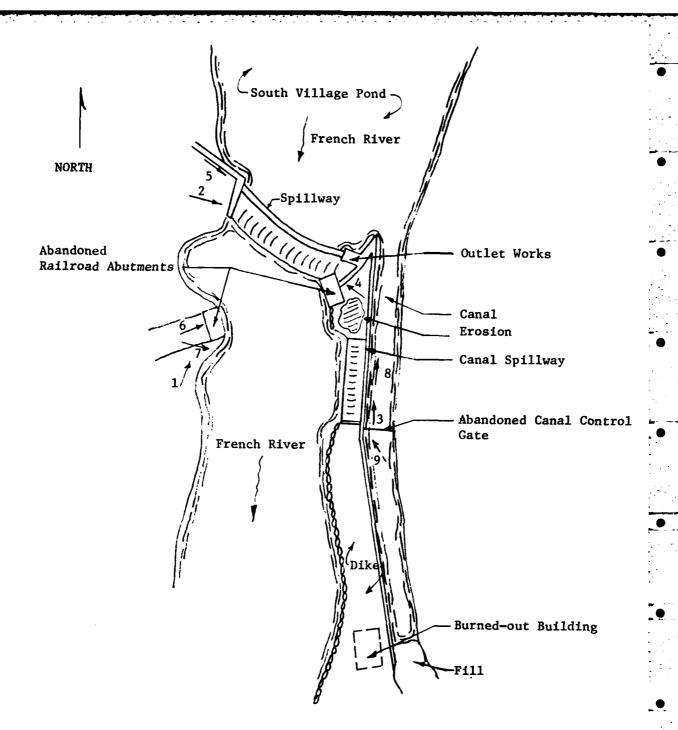


APPENDIX C SELECTED PHOTOGRAPHS OF PROJECT

Page No.

LOCATION PLAN

Location of Pho	otographs	C-1
PHOTOGRAPHS		
No.	<u>Title</u>	Page No.
1.	Overview of Dam from Abandoned	
	Railroad Bridge Abutment	iv
2.	Overview of Dam from Right Bank	C-2
3.	Overview of Dam from Downstream	
	end of Canal Spillway	C-2
4.	Overview of Main Spillay Crest	
	and Right Abutment	C-3
5.	Overview of Crest and Left Abutment	C-3
6.	Outlet Works at Left Abutment	
	of Dam	C-4
7.	Downstream Face of Canal Spillway	C-4
8.	Right Sidewall of Canal Spillway	C-5
9.	Abandoned Canal Control Gates	C-5



Notes:

- 1. PLAN BASED ON SEPT. 1936 AND MARCH 1939 DRAWINGS AND CDM FIELD OBSERVATIONS.
- 2. 1 DENOTES PHOTOGRAPH NUMBER AND DIRECTION OF VIEW.

CAMP DRESSER & McKEE, INC.
BOSTON, MASSACHUSETTS

U.S.ARMY ENG. DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION OF PHOTOGRAPHS

SOUTH VILLAGE POND DAM

Scale: Not To Scale

Date: November 1979

APPENDIX C-1



2. OVERVIEW OF DAM FROM RIGHT BANK.



3. OVERVIEW OF DAM FROM DOWNSTREAM END OF CANAL SPILLWAY.



4. OVERVIEW OF MAIN SPILLWAY CREST AND RIGHT ABUTMENT.



5. OVERVIEW OF CREST AND LEFT ABUTMENT.



6. OUTLET WORKS AT LEFT ABUTMENT OF DAM.



7. DOWNSTREAM FACE OF CANAL SPILLWAY.



8. RIGHT STDEWALL OF CANAL SPILLWAY.

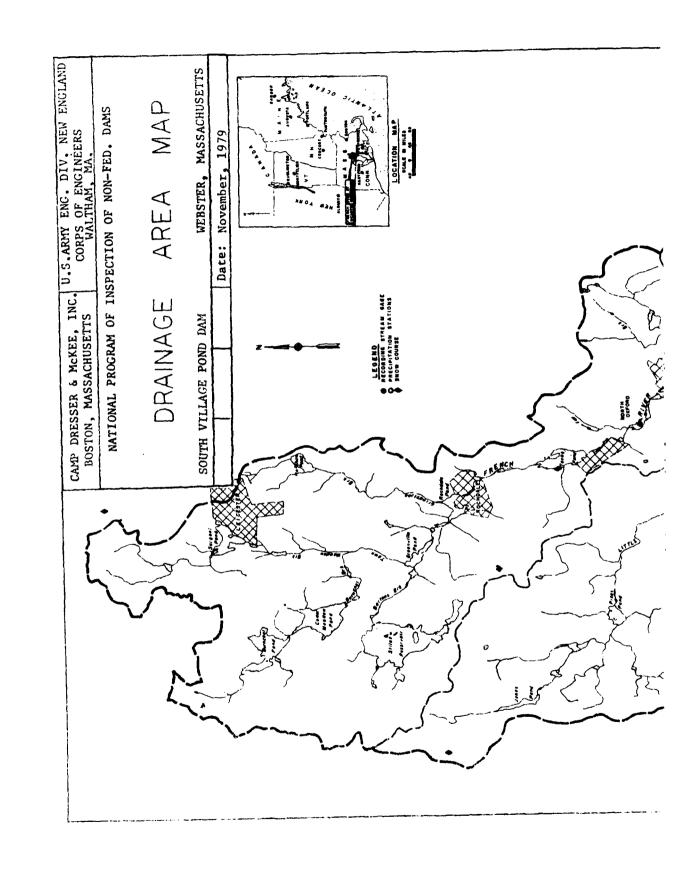


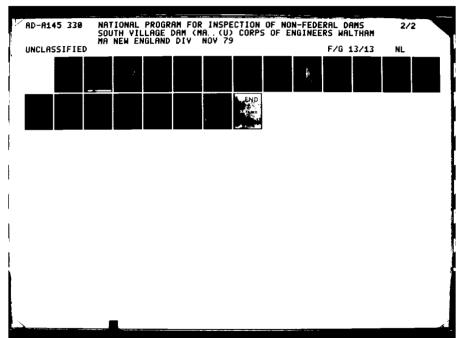
9. ABANDONED CANAL CONTROL GATES.

APPENDIX D

HYDRAULIC AND HYDROLOGIC COMPUTATIONS

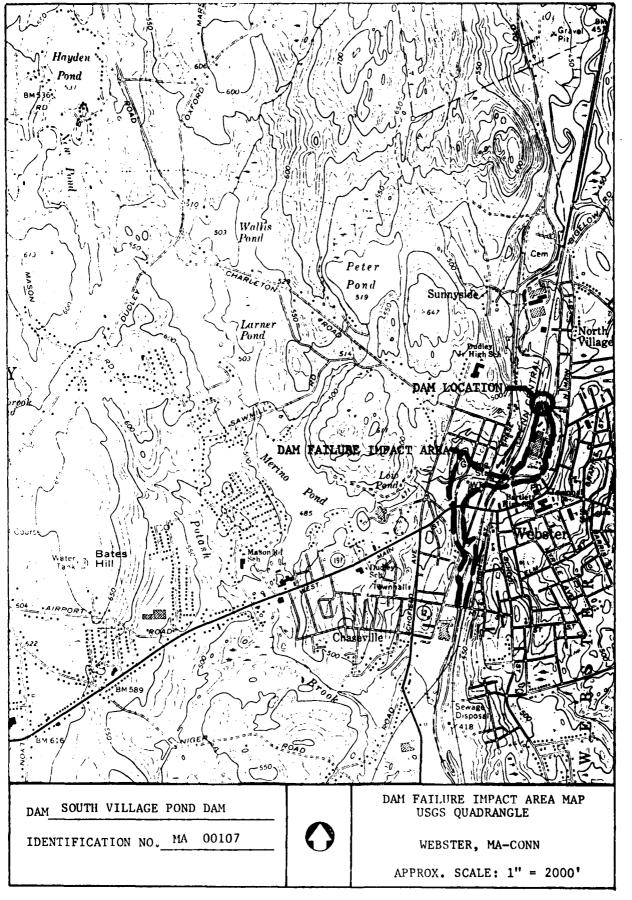
FIGURES	Page No.
Drainage Area Map	D-1
Dam Failure Impact Area Map	D-2
COMPUTATIONS	
Test Flood Development	D-3-4
Discharge and Storage Capacities	D-5-8
Surcharge-Storage Routing; Outlet Works Capacity	D-9
Tailwater Analysis	D-10
Dam Failure Analysis	D-11-17







MICROCOPY RESOLUTION TEST CHART NATIONAL BUREAU OF STANDARDS-1963-A



JOB NO. 380-6-RT-14 COMPUTED BY JOE CLIENT. PROJECT Dam DETAIL South Village Dam CHECKED BY_ Elevations (based on local Datum, which is 4.5 feet higher than NGV. Datum.

Spillway Crest Local Datum is the datum refered to an the plans in 135.6 Appendix B

Crest of Dam (Abut. El.) 439.9

Toe of Dam 424.0 SURFACE AREAS Drainage Area = (Diainage Area to U.S.G.S. Gaging at Webster, MA., about 2,750 ft. downstream of Dam) - (D.A. between Dam and U.S.G.S. Gaging Station) = 85.3 - 0.70 = 84.6 sq. miles. Area of Pool at Spillway Crest (El. 435.6) = 4 acres 454.5 = 273 acres STORAGE © Spillway Crest El. (El. 9356), Storage, based on above configuration is equal to 12 acre-feet © Water Surface El. 194.5, Storage = 12 + (1644)/2)89 = 235 ac-ft © W.S. El. 151.5, Storage = 235 + (273+46) 10 = 1830 ac-ft TEST FLOOD DETERMINATION The dam size is "small" based on a height of about 16-feet and a storage at the top of dom of 120 ac-ft. The hazard is "high" based on a wet-weather dam failure. Therefore, based on NED, Carps of Engineers Guidelines, the Test Flood range for South Village Dam is: Test Flood = 1/2 PMF to a PMF , use 1/2 PMF The drainage area to South Village is 84.6 square miles total Hydrologically, it is divided into three parts as a result of the construction of Hodges Village and the Bullumville Flood Control Reservoirs after the August 1955 t in the trench River upstream, of South V Both reservoirs ore upstream of South Village Dam and hydrologically divide the watershed into the portion tributary to Hodges Village Reservoir, the portion tributary to Buffumville Reservoir and the intervening portion between the Reservoirs and South Village Dom. Both reservoirs are Corps of Engineers Flood Control impoundment areas Basin.

JOB NO 380-6-RTH COMPUTED BY JOE. PROJECT Dan Inspection DATE CHECKED 10-19-79 DATE 10-15-79 DETAIL South Village Dam CHECKED BY JED The drainage area tributary to Hadges Village Reservoir
is 31.1 19 mi, and its "usable capacity" is 577,000,000
cubic feet, based on U.S. Dept. of Interior "Water
Resources Data for Massachusetts, New Homphsire, Rhode
Island, and Vermont". Based on the same reference,
The drainage area tributary to Buffum ville Reservoir
is 26.5 19, miles and its "Usable bapacity" is 555,000,000 cu.ft. The runoff for a 1/2 PMF is 9.5 inches. Given such a runoff from the D.A. tributary to the Hodger Village Reservoir, the reservoir could potentially retain up to 95 percent of the runoff. The Buffumville Reservoir could potentially retain about 04 percent Reservoir could potentially retains about 84 percent of the total runoff televitary to it under a lander of the total runoff televitary to it under a lander of the total four the observed assume a contribution of the post in the proof of the post in the proof of the post in the proof of the post in the four at south Village Dam is based on the drainage area downstream of the flood control reservoirs and upstream of the dain or an area of the square miles. About half of this area is tributary to lake choubunagunganaug, which has considerable storage potential. The other half lies along the french River which offers a wide flood floin. The test flood in flow rate is based on a point of the way between the "rolling" and flot and coastal culves of the NED lorps of Engineers "freliminary Guidance for Estimating Engineers "Preliminary Guidance for Estimating
Maximum Probable Discharge in Phase I Dan Safet
Investigations "March 1978. It is noteworthy that
the Hodges Village and Buffumville Reservoirs were
both used as data points in the development of
the above mentioned curves. Both reservoirs fall on the "rolling curve" . However, their watershed characteristics differ markedly from those for the 27 sg mi. drainage area downstream. Test flood Inflow 2 1 (1195 efs ... x 27 59 mi.) = 15,860 efs The approximate flow over the donn at the peak of the August 1955 flood was 14,300 cfs, based on an interpolation of the 14,400 cfs recorded at the USGS safing 31a. about 2,750 ft downstream.

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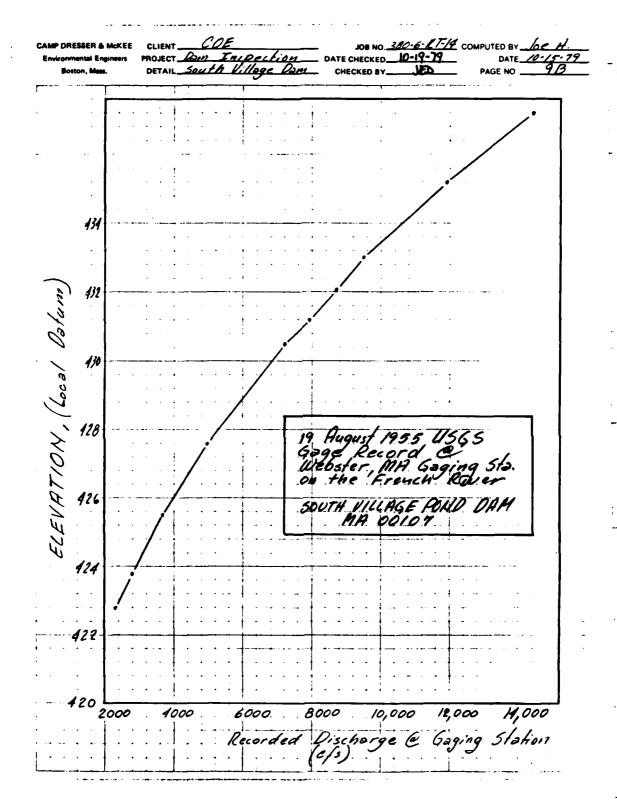
Client: COE Octoil: South Village Pand Pam Inspection

JOB NO. 300 15- RF / COMPUTED BY JOE DATE CHECKED 10-19-79 SURCHARGE-STORAGE ROUTING Inflow Test Flood, Qp = 15,850 cfs Surcharge Height to pass Qp is El. 444.45 STOR, = Surcharge Storage = 2300c-ftx 12 "Aft = 0.16 inches
Diainage Atea 17, 280 acres Probable Non. Flood, Op = Qp (1-5TOR) = 15,850 (1-0.16) = 15,580 efs Surcharge Height to pass ap is El. 444.35 STOR, = 225 ac-ft x 12 10/ft = 0.156 inches STORANG = 0.16 + 0.156 = 0.158 inches QP3 = 15,850 (1-0.158) = 15,585 cfs, say 15,600 cfs . Test Hood Inflow = 15,850 cfs Routed Tot Flood Outlow = 15,600 cfs Surcharge Elevation 2 144.4 spillway copouly at Test Flood Elevation (cler. 444.4): Q=CLH1.5 = 3.58 (100) (8.8) = 9,345, 524 9,350 cfs OUTLET WORKS CAPACITY The outlet works are two orifices at the left abutment of the spillway one has an invert elev. of 129.6 and an area of 4'wx4'H. The other is at invert elev. of 136.6 and has an area of 2.75'WX 2.5'H. With water surface at spillway crest, the copacity of the outlet works is: Q=CHVzgh, + CANygh, = 0.75(16)V2(32.2) 4 + Zero = 193 524 195 Cfs

Boston, Mass.	pineers PROJE DETA	CT <u>Dam</u>	Ensp Village 1	DATE CHEC	NO. 300-6-K	PAGE	NO
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JOB NO. 300-6-17:14 COMPUTED BY JOE H. DETAIL South Village De CHECKED BY DAM FAILURE ANALYSIS 1. Dry Weather Dam Failure Analysis Determine Outflow: Qp = 8/n (9) 1/2 (W) (16) where : g = 32 ft/sec2 Who Length of failure section. Assume 50% of the spillway fails, then Who soft = 50 ft Is = height of hydraulic failure section = 11.5 ft .. Qp = 8/ (322) (50) (1.5) 1.5 = 3,278 efs, say 3,300 cfs. By examining the 1955 Flood Water Surface profile downstream of the dam together with the rating curve at the USGS gaging station based 2,750 ft downstream of the dam, one can approximate a water surface profile for a flow of 3,300 cfs. Such a profile indicates that the flow due to a dry weather failure would be contained within the natural boundaries of the channel with a resulting "low" hazard. Approximate water surface profiles and support data are shown on the next four pages. 2. Wet Weather Dam Failure Analysis - Determine Discharge at the dam prior to a dam failure. Assume water surface at the top of dans (El. 439.9). Q = The through spillway + flow through the erifice of the left abutment from page 5, discharge @ W.S. El 439.9 is 4,650 cfs Again, based on the historical data mentioned above, the interpolated Water surface Profile for Qx 4,650 cfs indicates that the 62'W × 11.5'H stone channel which directs the French through the American Wooley Co. Courtyard about 700 feet downstream would be overtopped by about 2 to 2.5 feet. The American

### PROJECT LOSS LEGGE LOSS CHECKED BY JED PAGE NO 9 #### PROJECT LOSS LOSS CHECKED BY JED PAGE NO 9 ###################################		ESSER & McKEE	JOB NO. 380-6- LT-14 COMPUTED BY be H.
FLOODS, AUGUST-OCTOBER, 1985 S. FRENCK RIVER AT WENGTER, MASS. Lossion—Lat 42'03'03'', long 71'85'08'', on right bank 50 ft upstream from Pleasant-Steets bridge at Webster, Worcester County, and 1.1 miles upstream from Foren Potash Brook. Drainge area.—8.3 a mi. Gage-height record—Water-stage recorder graph except 1:15 p.m. Aug. 10 to 4:30 pm. Aug. 25 pm. 25 gept. 2-9, and 02 to 1.6-18. Gage height for period 1:15-6 pm. Aug. 19 are from graph based on floodmarks and readings from reference points and for period 4 pm. Aug. 21 to noon Aug. 22 from graph based on engineer's tape-gage reading. Datum of gage is 405.74 ta hove mean sea level, datum of 1992. Discharge record—Blage-discharge relation for 1955 flood period defined by current-meter measurement below 2,400 cfs and by indirect measurement at 1,400 cfs. Discharge for periods 8 pm. Aug. 19 to noon Aug. 21, Sept. 2-6, Garding and Control method used at times. Peak discharge of Mar. 19, 1965, by computation of flow over dam about half a mile upstream. Maxima—Given in the following table. August-October 1955: (Aug. 19, 5 p.m. 1964. 1936: Mar. 19. 1964. 1936: Mar. 19. 1964. 1936: Mar. 19. 1964. 1936: Mar. 19. 1965. Mar. 1965. Ma	-	-	7
Location.—Lat 42*03*03**, long 71*83*08**, on right bank 80 ft upstream from Pleasant-Street bridge at Webster, Worcester County, and 1.1 miles upstream from Potash Brook. Drainge area.—85.3 aq mi. Gag-height record.—Water-stage recorder graph except 1:15 p.m. Aug. 19 to 4:30 p.m. Aug. 22. Sept. 2-6, and Oct. 16-18. Gage height for period 1:15-6 p.m. Aug. 19 to noon Aug. 22 from graph based on sondamats and readings from reference points and for period 4 p.m. Aug. 21 to noon Aug. 22 from graph based on engineer's tape-gage reading. Datum of gage is 600.74 it above nean sea level, Discharge record.—Stage-discharge relation for 1955 flood period defined by current-meter measurements below 2,400 of and by indirect measurements at 14,400 cfs. Discharge for periods 8 p.m. Aug. 19 to moon Little River at Bufumville. Backwater from debris at times. Shifting-control method used at times. Peak discharge of Mar. 19, 1936, by computation of 50w over dam about half a mile upstream. Maxima.—Given in the following table. August-October 1985: (Aug. 19. 6 p.m. 14, 400 26. 05 Oct. 17. 1988 to July 1955: Sept. 12, 1954 1, 300 Remarka.—Flow appreciably affected by reservoirs above station. Flow for flood of August 19, affected by failure of dama upstream. ***August 19, affected by failure of dama upstream.** ****August 19, affected by failure of dama upstream.		······································	CHECKED BY JED PAGE NO TH
Location.—Lat 42*03*03**, long 71*83*08**, on right bank 80 ft upstream from Pleasant Street bridge at Webster, Worcester County, and 1.1 miles upstream from Potash Brook. Drainge area.—85.3 eq mi. Gags-height record.—Water-stage recorder graph except 1:15 p.m. Aug. 10 to 4:30 p.m. Aug. 22, Sept. 2-5, and Oct. 16-18. Gage height for period 1:13-6 p.m. Aug. 19 are from graph based on neodmarks and readings from reference points and for period 4 p.m. Aug. 21 to noon Aug. 22 from graph based on engineer's tapp-agar reading. Datum of gage is 400.74 th above hean see level, Discharge record.—Stage-discharge relation for 1955 flood period defined by current-meter measurements below 2,400 of and by indirect, measurements at 14,400 cfs. Discharge for periods 8 p.m. Aug. 19 to moon Aug. 22. Sprt. 2-5. Oct. 16-18 estimated on basis of records for Quinchaug River at Westville and Little River at Buffurwille. Backwater from debris at times. Shifting-control method used at times. Pask discharge of Mar. 19, 1936, by computation of flow over dam about half a mile upstream. Maxima.—Gluen in the following table. August-October 1955: (ph) (n) Aug. 19, 6 p.m. 14, 400 25. 05 Oct. 17. 1948 to July 1955: 1, 300 Sept. 12, 1954. 1, 300 Remarks.—Flow appreciably affected by reservoirs above station. Flow for flood of August 19, affected by failure of dama upstream. **Caga height, in feet, and discharge, in cubic feet per second, at insticuted time, 1965 **Aug. 19, 6 p.m. 1997. 1998.			
Location.—Lat 42°03'03", long 71°53'08", on right bank 50 ft upstream from Pleasant-Street bridge at Webster, Worcester County, and 1.1 miles upstream from Protash Brook. Drainge area.—83.3 at Webster, Worcester County, and 1.1 miles upstream from Potash Brook. Drainge area.—83.2 at Webster, Worcester County, and 1.1 miles upstream from Protash Brook. Drainge area.—83.2 at Webster, Worcester County, and 1.1 miles upstream from Protash Brook. Gap-height record.—Water-stage recorder graph except 1:15 p.m. Aug. 10 to 4.20 p.m. Aug. 23 ten on the 1:15 p.m. Aug. 10 to 4.20 p.m. Aug. 23 ten on Aug. 22 from graph based on engineer's tape-gap residing. Datum of gage is 400.74 it above mean see level, deatum of 1929. Discharge record.—Stage-discharge relation for 1035 flood period defined by statement measurement below 2,400 of and by indirect measurement at 14,400 and 12.18 graph and 12.18 graph and 12.18 graph and 12.18 graph and 14.19 to moon Aug. 21.8 graph 22.8 graph and 14.400 and 14.100 basis of records for Quinebaug River at Westville and Little River at 18 can basis of records for Quinebaug River at Westville and Little River at 18 can basis of records for Quinebaug River at Westville and title Rollward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at times. Shifting-control method used at title. Backward from others at the shifting-control method used at title. Backward from others at the shifting-control method used at title. Backward from others at the shifting-control method used at title. Backward from others at the shifting-control method used at the shifting-control method used at title. Backward from others at the shift		.	AUGUST-OCTOBER, 1955
Location.—Lat 42°03'03", long 71°53'08", on right bank 80 ft upstream from Plesam Bottset bridge at Webster, Worcester County, and 1.1 miles upstream from Plesam Botos. Drainge area.—83.3 ag mi. Gags-height record.—Water-stage recorder graph except 1:15 p.m. Aug. 10 to 4:30 p.m. Aug. 22, Sept. 2–3, and Oct. 15-18. Gage heights for period 1:15-5 p.m. Aug. 12 are from graph based on Soodmarks and readings from reference points and for period 4 p.m. Aug. 21 to noon Aug. 22 from graph based on engineer's tapp-aga-preading. Datum of gage is 400.74 it above nean sea level, deatum of 1929. Discharge record—Blage-discharge relation for 1035 flood period defined by statement at 14,00 cft. and 1929. Discharge record—Blage-discharge relation for 1035 flood period defined by the statement of 1929. Discharge record—Blage-discharge relation for 1035 flood period defined by statement at 14,00 cft. and 1929. Discharge record—Blage-discharge for priod of 5 p.m. Aug. 19 to noon Aug. 21, Sept. 2–5, etc. 15-18 statement below A,00 cft and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft. and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft. and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft. and by indirect measurement at 14,00 cft. 15-18 statement below A,00 cft. and 1920 in one Aug. 21, Sept. 2–5, Cft. 15-18 statement below A,00 cft. 15-18 statemen	-		RIVER AT WERNTED MANG
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Drainge area—88,3 ag mi. Gage-height record.—Water-stage recorder graph except 1:15 p.m. Aug. 10 to 4:30 p.m. Aug. 22, 8ept. 2-d., and Oet. 16-18. Gage heights for period 1:15-6 p.m. Aug. 21 er from graph based on floodmarks and recolings from reference points and for period 4 p.m. Aug. 21 to noon Aug. 22 from graph based on engineer's tape-gage reading. Datum of gage is 406.74 ft above nean sea level, datum of 1929. Discharge record.—Stage-discharge relation for 1035 flood period defined by current-meter measurement below 2, 400 cfs and by indirect measurement at 14,400 cfs. Discharge for periods 8 p.m. Aug. 19 to noon Aug. 21. Sept. 2-d. Oct. 16-18 eatimated on basis of records for Quinebaug River at Westville and Little River at Busfumville. Backwater from debris at times. Shifting-control method used at times. Peak discharge of Mar. 19, 1936, by computation of flow over dam shout half a mile upstream. Maxima.—Given in the following table. August-October 1935: August-October 1935: Goge high, 1956. 1036: Mar. 10. Remarka.—Flow appreciably affected by reservoirs above station. Flow for flood of August 19, affected by failure of dams upstream. Maxima.—Given for dams u			ster, Worcester County, and 1.1 miles upstream
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Environmental Engineers	PROJECT	Len_	TALP.	DATE CHE	CKED10-19	<u>1-79</u>	DATE 10-15-79
Boston, Mass.	DETAIL	South	Village Dung	CHECKE	D 8YJE	<u> </u>	PAGE NO
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	k	& Hartford	s., New York, New Hav RR. bridge.	1	do	442.2	
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JOB NO. 300-6-RT-N COMPUTED BY Joe. H PROJECT Dam Trip. DATE CHECKED 10-14- My DETAIL South Village Dam CHECKED BY JED _ DATE CHECKED 10-19-79 DATE 10-15-75 The depth of flooding at the American Worlen to would increase from about 2 feet prior to a dam failure to about 4 feet after failure. Water would be about 3 feet above window sill elevations, thus eduring high economic damage to the mill complex Given that the wet weather conditions prior to follure had to an evacuation of the mill, the additional flooding due to a dam failure should not endanger mill personnel. Bolween the American Woolen Co. and Peter Street, which is about 1,350 feet downstream of the clim.
there would be overbank flooding of about 5 feet.
The 60'W x 15'H Peter Street bridge would be over topped
by about 3 feet. Several homes on the right bank
would be overrun by about 5 feet of water. Between Peter Street bridge and Tracey Court Bridge
located about 2,280 feet downstream of the down
a mill building on the right bank would be
flooded by about 3-feet endongering the workers
in the smill and causing economic damage.
The Tracey Court Bridge Vis a Concrete bridge
similar to the Peter Street Bridge. Downstream of Tracey Court Bridge, Pleasant Street would be over to paked by about 2 feet, and Main Street, also called by 197, 12 and 31 would be overtopped by about 8 foot. The overbanks in this reaches are heavily developed and would be flooded by about 30 to 4 feet of water. Downstream of Main Street there would be additional flooding of the development along the left obank down to Hill Street. Beyond Hill Street the flood wave would attenuate to a level about that existing prior to a dam failure due to woth weather conditions. Based on the foregoing analysis, a wet weather foilure of the south Village dam would cause HIGH Hazard downstream of the dam.

APPENDIX E INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

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MAPOUNDING CAPACITIES 3104 LATITUDE NAME OF IMPOUNDMENT INVENTORY OF DAMS IN THE UNITED STATES FALNCH BIVER
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NEAREST DOWNSTREAM
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